United States Court of Appeals
for the
District of Columbia Circuit

TRANSCRIPT OF RECORD

APPENDIX TO BRIEF FOR APPELLANT.

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT.

Appeal No. 13,948

ROBERT C. SWITZER,
Appellant,

vs.

ROBERT C. WATSON,
Commissioner of Patents,
Appellee.

United States Court of Appeals
For the
District of Columbia Circuit
FILED SEP 6 1957
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Appeal from Judgment of
the United States District Court
for the District of Columbia.

Albert L. Ely, Jr.,
Ely, Pearne & Gordon,
912 Midland Building,
Cleveland 15, Ohio,
Attorneys for Appellant.

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APPENDIX.

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF COLUMBIA.

No. 5243/54.

ROBERT C. SWITZER,
Plaintiff,
vs.
ROBERT C. WATSON,
Commissioner of Patents,
Defendant.

COMPLAINT FOR ISSUANCE OF A PATENT.

(Action under 35 U. S. C., Sec. 145.)

(Filed December 10, 1954.)

Plaintiff herein for his complaint alleges:

I.

This is a suit brought by Robert C. Switzer, a citizen of the United States, whose residence is 23400 Stanford Road, Shaker Heights, Ohio.

II.

That defendant Robert C. Watson, as Commissioner of Patents of the United States, is a citizen of the United States, whose official residence as such Commissioner is in the District of Columbia, and is named as the defendant in this Complaint in his official capacity as Commissioner of Patents of the United States.

III.

That this is a suit brought under the patent laws of the United States, and more particularly under and pursuant to the provisions of Title 35, United States Code, Section 145.

IV.

That heretofore, to wit, on April 6, 1949, plaintiff was the true, original and first inventor of certain new and useful improvements in Flaw Detection, for which plaintiff was and is entitled to a patent under the provisions of Title 35, United States Code, Part II.

V.

That being, as stated, the original, first and sole inventor of said improvements and entitled to a patent therefor, the said plaintiff, on or about the 6th day of April, 1949, duly filed in the United States Patent Office an application for Letters Patent on said invention, Serial No. 85,749, said application complying in all respects with the requirements of the law in such cases made and provided.

VI.

That the Primary Examiner of the United States Patent Office, to whom said application was assigned, finally refused allowance of the following claims in said application:

3. The method of detecting flaws in the surface of test bodies comprising the steps of applying to the surface of the test body a solution containing a penetrant and a coloring matter therefor, maintaining the solution in contact with the surface of the test body for a period of time of sufficient duration that the solution may penetrate the surface flaws present, removing from the surface the solution which has not penetrated said flaws, and applying to the surface of the body a second coating solution which absorbs the coloring matter of the first solution retained in and about the surface opening of the flaws.

4. A method as defined in Claim 3 in which said second solution is colored to provide a contrasting back-

ground for the coloring matter of the first solution and absorbed by the second solution.

* * * * *

11. The method of detecting, in a test body, subsurface flaws having surface openings comprising the steps of applying to the surface of the test body a testing agent comprising an oily liquid capable of wetting the surface of the test body and a dye dissolved in said liquid, removing said testing agent from the surface of the test body, allowing the portion of the testing agent which had penetrated said surface openings to exude therefrom, and then inspecting said test body under visible light, whereby the extent and location of the flaws will be revealed and magnified by the color contrast between the exuded testing agent and adjacent areas of the test body, the colored dye having been selected to impart a color to the testing agent distinctive from the color of the surface of the test body.

VII.

That in due time and in compliance with the laws and regulations in such cases made and provided, an appeal was taken from said final rejection to the Board of Appeals of the United States Patent Office, and the said Board of Appeals, after hearing the Appeal, as the plaintiff submits, incorrectly and contrary to the law and the facts submitted to said Board of Appeals, affirmed the final rejection made by the Primary Examiner, and refused a patent to the plaintiff upon the said application, as from duly authenticated copies of said application of plaintiff and of the aforesaid proceedings in the Patent Office will more fully and at large appear.

VIII.

Plaintiff further states that no appeal has been taken from said decisions of the Board of Appeals to the Court of Customs and Patent Appeals, Washington, D. C., or to any other higher tribunal, and no such appeal is pending or has been decided, and this Complaint is filed within the thirty-day period following the decisions of the Board of Appeals of October 11, 1954 and November 30, 1954, as appointed by defendant under the provisions of 35 U. S. C. 145.

WHEREFORE, plaintiff brings this suit under and in accordance with the provisions of the statute made and provided in such cases, and prays this Honorable Court:

1. To decree that plaintiff Robert C. Switzer is the true, first, and sole inventor of the improvements described in said application and defined in said claims 3 to 11, inclusive, aforesaid, and each of them, and that plaintiff Robert C. Switzer is entitled to receive Letters Patent of the United States for such invention.

2. To authorize and direct the Commissioner of Patents to issue to Robert C. Switzer a patent on the claims aforesaid and each of them.

3. That summons addressed to the defendant, Robert C. Watson, issue out of this Court commanding him to appear and answer this Complaint and to abide by and perform such order and decree as this Court may adjudge.

4. For such other, further, and alternate relief as equity may require.

ROBERT C. SWITZER.

(Attorneys' names omitted.)

ANSWER TO THE COMPLAINT.

(Filed December 23, 1954.)

To the Honorable the Judges of the United States District Court for the District of Columbia.

I, II, III. The defendant admits the allegations of paragraphs I, II and III of the complaint.

IV. He denies the allegations of paragraph IV.

V. He denies that the plaintiff is the original, first and sole inventor as alleged in paragraph V. He admits the remaining allegations of that paragraph.

VI. He admits the allegations of paragraph VI.

VII. He denies that the action of the Board of Appeals was incorrect or contrary to the law or the facts submitted to the Board of Appeals. He admits the remaining allegations of that paragraph.

VIII. He admits the allegations of paragraph VIII.

FURTHER ANSWERING, the defendant states that the plaintiff is not entitled to a patent containing any of the claims set forth in the complaint for the reasons given and in view of the references cited in the Examiner's Statement and the decisions of the Board of Appeals in the plaintiff's application here involved. Profert of copies of the said statement, decisions, and references is hereby made.

(Attorney's name omitted.)

TRANSCRIPT OF PROCEEDINGS.

Washington, D. C.
Monday, February 25, 1957

The above-entitled matter came on for hearing before Honorable ALEXANDER HOLTZOFF, judge of the United States District Court, at 3:15 p. m.

APPEARANCES:

On Behalf of the Plaintiff:

ROBERTS B. LARSON, ESQ., Washington, D. C., and ALBERT L. ELY, JR., ESQ., Cleveland, Ohio.

On Behalf of the Defendant:

JOSEPH SCHIMMEL, ESQ.

* * * * *

(31) Thereupon [February 26, 1957] JOSEPH LYMAN SWITZER was called as a witness by and on behalf of the plaintiff and, having been first duly sworn, was examined and testified as follows:

(32)

DIRECT EXAMINATION by Mr. Ely.

Q. Will you state your name and address. A. Joseph Lyman Switzer. Gates Mills, Ohio.

Q. What is your occupation? A. I am vice-president in charge of research for Switzer Brothers, Incorporated, of Cleveland, Ohio.

Mr. Ely: For this preliminary may I use leading questions?

By Mr. Ely:

Q. Your company manufactures penetrants for testing procedures, does it not? A. Yes.

Q. Is it correct that your company is the largest manufacturer of penetrants for testing procedures used in this country? A. Yes.

Q. Is it true you have licensees abroad? A. Yes.

Q. How long have you been engaged in the testing and evaluating of penetrant systems of flaw detection and penetrants for such systems? A. Approximately 15 years.

Q. I hand you here Plaintiff's Exhibit 2.

Mr. Ely: Mr. Schimmel, this is the official (33) Patent Office translation taken from the records in the 606708 appeal.

Mr. Schimmel: Yes.

Mr. Ely: I beg your pardon. Number 1 is the file history.

The Court: Are you offering it in evidence, or marking it for identification?

Mr. Ely: May I mark them all for identification. I will move later, if you wish.

The Court: No. Offer them in evidence as you go along. Why do two things when you need only do one.

Are you offering this in evidence?

Mr. Ely: Yes.

The Court: What is it you are offering in evidence?

Mr. Ely: It is an official Patent Office translation of the Swiss reference patent issued to I. G. Farbenindustrie.

The Court: Very well.

> (Thereupon, Plaintiff's Exhibits Nos. 1 and 2 were marked for identification and were received in evidence.)

The Court: I see that the time for our luncheon recess has arrived. We will recess at this time for our lunch.

(34) Afternoon session.

The Court: We will proceed with the case on trial. You may proceed, Mr. Ely.

Mr. Ely: May it please the Court, I would like to have marked and introduce into evidence as Plaintiff's Exhibit 1 the file history of the patent application in suit.

The Court: I have it here, have I not?

Mr. Ely: Yes.

The Court: It may be admitted.

(Thereupon, Plaintiff's Exhibit No. 1 previously received in evidence, was introduced.)

The Court: You may proceed.

Thereupon JOSEPH LYMAN SWITZER resumed the stand and, having been previously duly sworn, was further examined and testified as follows:

DIRECT EXAMINATION by Mr. Ely (Continued).

Q. Referring to Exhibit 2, copy of which you have, the notation on the side, "Library, August 29, 1956, [1946] U. S. Patent Office," is the date of the receipt of that?

The Court: I will take judicial notice of that.
Mr. Ely: Thank you, sir.

(35) By Mr. Ely:

Q. Have you endeavored to evaluate the method disclosed and particular specific example thereof in that Swiss Patent, example 2? A. Yes. I have performed the example very carefully, and read the patent very thoroughly.

Q. I have here a block of metal, which I would like to have identified as Exhibit 3, and a paper entitled, "Mili. 25135 ASG." Will you please tell the Court what these exhibits are.

The Court: Have you shown these to the other side? Maybe they can be stipulated.

By Mr. Ely:

Q. Will you please tell the Court what these exhibits are. A. The paper is a military specification for inspection of materials; that is, penetrant inspection materials. The metal block is a test specimen which has been purposely cracked by a method described in this government specification in order to produce a sample cracked metal block which can be used to evaluate one type of penetrant against another.

Q. How is that evaluation done? A. The cracks are made so that they run more or less along the line of the block by heating the block in the (36) center to about 1000 degrees, and then suddenly quenching it. That produces numerous crack lines in the block and they radiate out from the center. We then saw a small cut in the center so that we could apply one penetrant on one side of the test block and another on the other side; and by looking at the indications compare the indications produced by one method versus another on the same identical block.

Q. Can you tell the Court about the range or variety of sizes of cracks in that test block? A. There are numerous types of thermo-shrinkage cracks in this block. Some of them—a few—are so large that they can be seen with the naked eye. Most of them are very fine and consequently invisible to the naked eye.

Q. How long has that type of test block been approved and available for comparison of penetrant systems? A. This specification was set up August 1956.

Q. Will you please tell the Court how you evaluated the process disclosed in the Swiss Patent.

Mr. Ely: I have here a bottle which I would like to identify as Exhibit 4.

May it please the Court, I would like to introduce into evidence Exhibits 3 and 3-A.

The Court: Very well.

> (Thereupon, Plaintiff's Exhibits 3 and 3-A were marked for (37) identification and were received in evidence.)

The Court: What are you trying to do just now, Mr. Ely?

Mr. Ely: I am attempting to establish the evaluation of the Swiss Patent as disclosing an inoperative and useless—

The Court: You want to prove inoperativeness of the Swiss Patent?

Mr. Ely: Yes.

The Court: I am wondering how that is relevant. I think it would be relevant if the Patent Office relied upon the Swiss Patent as an anticipation; but I understand that the Patent Office does not rely upon the Swiss Patent as anticipation, but merely as evidence of prior art, or prior disclosures, and therefore bearing on the question of whether the step taken by the inventor here was a mechanical advance or an exercise of the inventive faculty.

Mr. Schimmel: That is right. We are not urging it as an anticipation.

The Court: If it is not urged as anticipation, and I so understood from the opinion of the Board of Appeals, it is immaterial whether it is inoperative or operative.

I notice—do you wish to make a statement or objection?

(38) Mr. Schimmel: I want to make a statement in regard to offer of proof of inoperativeness. I think he is estopped of doing that in view of the antecedent case before the Court of Customs Claims and Patent Appeals as well as—

The Court: There may be estoppel, right of recovery, but I cannot apply estoppel as to the offer of evidence. On this other point I think you should bear in mind this is not offered in anticipation. If not offered in anticipation what difference does it make, operative or inoperative?

Mr. Ely: Your Honor, I did not so understand the position of the Patent Office, either by the Board of Appeals or either yesterday from Mr. Schimmel; rather presumably on the basis of what the Swiss Patent discloses and in combination with the Switzer Patent those two combined references were anticipatory of the claim in suit.

The Court: I understand that that is not the position of the Patent—

Mr. Schimmel: That is not the position of the Patent Office. We say there is no invention in view of the disclosures of two prior publications.

The Court: That is what the Court understood; therefore inoperative, and this is immaterial.

Mr. Ely: Your Honor, may I take the position that I think it is frequently held that an inoperative disclosure (39) is not only no disclosure at all but because it is inoperative, a fact we would like to establish in this trial de novo, it is evidence of invention in going contrary to or doing something other than in the publication. In other words, one of our problems is to establish invention.

The Court: What do you say?

Mr. Schimmel: I say a clear disclosure already, whether operative or inoperative under the still prior disclosures available in use, in combination with other disclosures.

The Court: I will not let you go into detail as to operativeness. In order to save time if you state briefly why you think it is operative I will let you do it, in the interest of saving time.

I do not consider the evidence relevant, but I will let you make your record provided it can be done without unnecessary consumption of time.

Mr. Ely: I think it can be. I would like to identify Exhibit 4, a bottle.

The Court: Suppose you offer things in evidence instead of identifying them first and marking them first and then offering them into evidence. Suppose you cut the process short by doing it all at once.

Mr. Ely: All right, sir.

The Court: That saves time and work.

(40) Mr. Ely: That is fine.

The Court: What are you doing?

Mr. Ely: I am showing the—

The Court: What are you doing with it?

Mr. Ely: I am going to have Mr. Switzer tell briefly—

The Court: What are you doing with it now? For what purpose are you handing—

Mr. Ely: Marking the exhibit so they will not be confused in the record, Your Honor.

The Court: Offer it in evidence, first.

Mr. Ely: All right, sir.

The Court: I told you how to proceed; now you proceed in accordance with the Court's—

Mr. Ely: I wish to offer in evidence this bottle.

The Court: Have it identified, first.

By Mr. Ely:

Q. Will you tell us what that bottle is, Mr. Switzer? A. The bottle is a 5 per cent nitric acid solution used as an etch and proposed in this Swiss specification.

Q. Will you tell what the next bottle I hand you is, please. A. It is an 8 per cent of potassium bichromate containing, also, ½ per cent of ammonium acetate.

Q. How is that suggested in the Swiss Patent? **(41)** A. That is the penetrating solution suggested by the Swiss Patent.

The Court: I would not leave those on the edge there.

Mr. Ely: May I introduce into evidence these two bottles as Exhibits 4 and 5.

The Court: Then hand them to the clerk. They may be admitted.

> (Thereupon, two bottles were marked for identification as Plaintiff's Exhibits 4 and 5, respectively, and were received in evidence.)

By Mr. Ely:

Q. I hand you a test block. Will you please tell the Court what that test block is? A. This is a test block that has been artificially cracked in the manner described by the military specification. The test block has been subjected, first, to the etching solution as suggested by the Swiss Patent, and then thoroughly rinsed. Then it was immersed in the bichromate solution and held at a temperature of about 70 to 80 degrees for a period of about 30 minutes. It was then taken out and rinsed with cold water and dipped into hot water in order to heat the block up and dry it.

(42) The Court: I do not want all those details. I told you I shall not—are you trying to prove inoperativeness of the Swiss Patent?

Mr. Ely: Sir?

The Court: Are you trying to prove the inoperativeness of the Swiss Patent?

Mr. Ely: And I want to show what sort of results the art got to show the advance of this over the art.

The Court: I consider that irrelevant.

By Mr. Ely:

Q. Did you find from that test block which you have in your hand any indications of cracks that you could not see beforehand? A. No.

Mr. Ely: May I introduce this test block into evidence?

The Court: It may be admitted.

> (Thereupon, test block was marked for identification as Plaintiff's Exhibit No. 6, and was received in evidence.)

By Mr. Ely:

Q. I hand you here a bottle of black liquid. Will you tell briefly what that black liquid is. A. That is a water solution of nigrosine.

(43) Q. What is the significance of that? Will you tell that to the Court? A. That was one of the colored solutions suggested by the Swiss Patent.

Q. Alternative? A. Alternative.

Q. I hand you a test block. Will you tell the Court what that test block is, please. A. A test block subjected to the effect of the nigrosine solution.

Mr. Ely: I wish to introduce this bottle and test block in evidence.

The Court: They may be admitted.

> (Thereupon, test block and nigrosine solution were marked for identification as Plaintiff's Exhibits Nos. 6 and 7, respectively, and were received in evidence.)

The Court: No more. I think you have enough on this issue. I told you that I consider it irrelevant; and if you can offer evidence, very briefly, on the subject you will make your record.

Mr. Ely: Your Honor, I would simply like to ask Mr. Switzer this—

(44) The Court: How much more of those have you?

Mr. Ely: This is the last of the Swiss patent.

The Court: Very well.

By Mr. Ely:

Q. Mr. Switzer, I have here a bottle of black liquid and a test block. Did you similarly experiment with this liquid and test block in order to make the Swiss patent work, or see if within the skill of the art you could make it get any flaw indications as you did with respect to the previous black bottle and test block? A. Yes. I did; only that solution of nigrosine in alcohol. That was another alternative mentioned.

Mr. Ely: I wish to introduce these into evidence, please.

> (Thereupon, test block and solution nigrosine in alcohol, were marked for identification as Plaintiff's Exhibits Nos. 8 and 9, respectively, and were received in evidence.)

By Mr. Ely:

Q. Did you get any better result with any of these experiments over that of the specific example of the Swiss reference? A. No. I did not.

(45) Q. Did you get any result that would be at all acceptable as a method by the government, or meeting these government specifications? A. No. I did not.

Q. Will you please explain to the Court the invention in suit.

The Court: What exhibit number are the government specifications?

Mr. Ely: Plaintiff's Exhibit 3-A.

The Court: You may proceed.

By Mr. Ely:

Q. I hand you here a bottle of red liquid. Will you please tell the Court what that red liquid is. A. This is a penetrating oil that contains an oil soluble colored dye; a high proportion of the dye in the penetrating oil prepared in accordance with the specifications in the application in suit in an oil-soluble dye.

The Court: In other words, a combination of an oil and a dye?

The Witness: An oil and a dye. That is right.

By Mr. Ely:

Q. What did you do with that liquid following the specifications in suit—the invention in suit? A. I applied it to a test block that had been purposely cracked similar to these other test blocks I have (46) described and allowed it to stand for a few minutes until the penetration was complete. That was done at room temperature. Then I wiped off the excess from the surface and then applied a second solution to that test block.

Q. I hand you here a bottle of white liquid. Is that the solution of which you are speaking? A. Yes. That is the absorbing solution I applied to the test block after I had removed the penetrant from the surface.

Mr. Ely: May I introduce these two bottles in evidence, Your Honor?

The Court: They may be admitted.

> (Thereupon, test block, two bottles of solution, were marked for identification as Plaintiff's Exhibits 10, 11, and 12, respectively, and were received in evidence.)

The Court: You may proceed.

By Mr. Ely:

Q. I hand you here a test block. Will you tell the Court what that test block is, and what it shows. A. That is the test block that I just described the experiment with. It shows the cracks and the crack patterns in this block very vividly. The stains that come out on the (47) white absorbent layer indicate the presence of the flaws and their nature underneath. The large blocks indicate very large cracks.

Q. Are those the cracks you would be able to see with the visible—I mean see with the naked eye? A. That is right. And the very fine numerous patterns are the invisible flaws that are in this block. This is a demonstration of the process in suit.

Q. This arcuate pattern of cracks you see on the face of this exhibit, that arcuate crack you refer to was produced in invisible cracks produced according to this government specification? A. That is correct.

Mr. Ely: May I introduce this test block into evidence?

The Court: It may be admitted.

(Thereupon, test block was marked for identification as Plaintiff's Exhibit No. 13, and was received in evidence.)

The Court: You may proceed.

By Mr. Ely:

Q. I hand you here another block which has some red indications on one side, and nothing on the other. Can you tell us what that is, please. **(48)** A. That is a test block that was prepared in accordance with the military specification, cracked in accordance with it, and tested with the Swiss material on one half of the block, and the Switzer materials on the other half of the block, and the developer put on both sides, developing solution applied on both sides so that it combined the use of the developer and the Swiss penetrant on one side and the Switzer process on the other.

The Court: Which Switzer process? Of course, there is the old Switzer patent and the Switzer application.

Mr. Ely: Yes.

By Mr. Ely:

Q. It is the Switzer patent you are speaking of?

The Court: He says Switzer patent?

Mr. Ely: He said Switzer process.

By Mr. Ely:

Q. You mean patent? A. I will clarify. On one side—

The Court: Answer the question.

By Mr. Ely:

Q. You mean that the developer or the white absorbent material put on there was in accordance with the Switzer reference patent. Is that correct? A. Yes.

Q. Not the application? **(49)** A. The Switzer 400 patent. The developer.

Q. Is there anything in the Swiss patent that says anything about putting an absorbent solution over the test materials used by the Swiss patent? A. No. There is not.

Q. Where was that suggestion taken from? A. From the Patent Office. They combined the idea.

The Court: From where?

The Witness: The Patent Office combined the idea of using the Swiss patent and the absorbent material that was described in the Switzer 400 patent. That is what I endeavored to do.

Mr. Ely: May I introduce this block into evidence?

The Court: It may be admitted.

(Thereupon, test block was marked for identification as Plaintiff's Exhibit No. 14, and was received in evidence.)

By Mr. Ely:

Q. When so combining the Swiss disclosure and the Switzer disclosure did you obtain the results—quantitative or otherwise—that are obtained by the invention in suit? A. No. I did not.

Q. I hand you here a bottle and another test block. Will you please tell the Court what the bottle contains and **(50)** what the test block is? A. This bottle contains a penetrating oil with a fluorescent agent in it. It is not a colored dye but it has a powerful fluorescent agent in it.

Q. That is made according to what disclosure? A. To the Switzer 400 patent.

The Court: You say "Switzer 400 patent." The old patent?

Mr. Ely: That is the one. The Switzer patent cited in the prior art.

The Witness: The test block is a test block that has the cracks prepared in it and to which this penetrant has been subjected and the penetrant was then removed from the surface and is in the crack; remains only in the cracks, not on the surface.

By Mr. Ely:

Q. This block, then, has been subjected to the process of the Switzer patent. Is that correct? A. It has been.

Q. Are there any cracks apparent on the surface of this block which can be seen in this light? A. There are no cracks except those that were large enough to see before the test.

Q. That you could with the naked eye? A. That is right.

(51) Q. Is it possible to locate the cracks in that block according to the old Switzer patent? A. It is not possible in a lighted room like this.

Q. How can it be done? A. It must be taken into the dark; or the room has to be darkened and we have to project upon it an ultraviolet light which will make the little traces of fluorescent penetrants that are in the cracks glow out and distinguish themselves.

Q. Is it possible for you to do that here in the courtroom? A. It is, if the Court so desires.

The Court: To do what?

Mr. Ely: To show the indications of cracks on this block as to which the Switzer—

The Court: Is there any question that the cracks would be indicated?

Mr. Schimmel: No question at all.

The Court: Then it is not necessary.

By Mr. Ely:

Q. Then, Mr. Switzer, assuming the room were darkened how would those cracks—and then what would have to be done? A. The room would have—

The Court: I do not think it is necessary. It is admitted that the cracks would appear. Is that it?

(52) Mr. Schimmel: That is right.

Mr. Ely: I wish to bring out, for the purpose of comparison and evaluation of the invention in suit and advance over the art, the steps that are necessary.

The Court: How the room must be darkened does not show it.

Mr. Ely: Not how the room is darkened. I will ask after the room is darkened then what additionally must be done in order to make the cracks apparent.

The Court: What is the answer?

The Witness: You must subject it to black light and examine it while the black light is on it. The black light causes the luminescent material to glow out and you can see the cracked pattern by the light emission.

The Court: Is this in accordance with the teaching of the claims in suit, or is this in accordance with the old Switzer patent?

Mr. Ely: This is in accordance with both the old Switzer patent and the Ward patent.

The Court: I see. Very well. Is it also in accordance with claims 1 and 2 of the pending application?

Mr. Ely: No, sir.

The Court: Very well.

Mr. Ely: I would like to introduce these two exhibits in evidence, if you please.

(53) (Thereupon, bottle of fluid and test block were marked for identification as Plaintiff's Exhibits Nos. 15 and 15-A, and were received in evidence.)

By Mr. Ely:

Q. Can you explain to the Court the different phenomena, assuming that there are different phenomena, and correct me if the assumption is not correct, can you explain the different phenomena involved in fluorescent indications and fluorescent penetrants systems and the color system or method here in suit?

The Court: I suggest that you reframe your question and make it a little more narrow. Just what do you want to bring out?

By Mr. Ely:

Q. What is the phenomenon that makes the fluorescent systems, as disclosed in the Switzer patent or the Ward patent, both of reference, operate? A. It is the phenomenon of fluorescent; the emission of light from small traces of material; fluorescent substances. And it can only be observed in darkened conditions under special lights.

Q. With respect to the test block, or a test body, why does the black light cause indications of the location of the (54) flaws when the test bodies are viewed in darkness?

The Court: I do not think that is material now. We know what can be accomplished with the prior art. This is part of the prior art. Let us move along to the invention.

Mr. Ely: The invention, I want to bring out, Your Honor, is this: That entirely different phenomena are involved.

The Court: I understand it.

Mr. Ely: That no one would expect from the phenomenon of one that the phenomenon of the other would appear.

The Court: Do I understand the claimed invention consists of the use of dyes in this mixture, and as a result of the use of dye you do not have to have a dark room and you do not even have to use dark light, but you can examine your test material in regular light, is that it, after this is done?

Mr. Ely: With certain essential additions your statement is correct; but there are essential differences.

The Court: Let us not be so ponderous about it. Let us get to the invention and let us do it briefly.

You know you have been going on for half an hour and we have not had the invention yet.

By Mr. Ely:

Q. What volume of penetrants are in these cracks that (55) you can see by the fluorescent system? A. It ranges. It is a wide variety of volume, but the small ones contain a very, very minute amount of penetrant. They are very fine cracks.

Q. By what phenomenon does the invention in suit operate? A. By the phenomenon of selective color absorption. The dye is in high concentration in the cracks and seeps out eventually on to the surface and becomes visible by virtue of a spread out and by virtue of an absorptive material that may be used with it. It is surprising that such a small amount of dye—if it is in an oil or oil-like solution—will create a stain that you can see. But it is true if it is made into an oily penetrant in the proper strength—

The Court: I do not suppose the—and I am going to ask Mr. Schimmel about that—Patent Office will dispute the fact that the alleged invention is both operative and useful?

Mr. Schimmel: No question.

The Court: And simpler to operate than the prior process, because you eliminate having to darken your room and the use of black light, and so on; and the only issue in the case is whether to devise this process, which is both operative and useful, required an inventive step, exercise of the inventive faculty, or mechanical faculty, in the light (56) of the early disclosures?

Mr. Ely: You are coming to my key question.

The Court: I have come to it and I want you to come to it, too. In other words, I do not want this to progress like a slow freight. Let's move along like an express train.

By Mr. Ely:

Q. Would anyone skilled in the art expect that the small volume of liquid retained in the cracks would ever be sufficient to give a visible indication of these cracks that are so tiny that they are invisible to the naked eye?

The Court: It calls for a yes or no answer.

The Witness: May I have the question, again?

(Question read by the reporter.)

By Mr. Ely:

Q. Was there anything in the prior art which makes any such suggestion? A. Not to my knowledge.

Q. Does any of the prior art of record here? A. No.

Q. One further question. Do you have any interest or ownership, either directly or through your corporate ownership—that is, through your ownership of Switzer Brothers, Incorporated—in the invention and application in suit? (57) A. No. I do not.

The Court: Who is the owner of the application in suit?

The Witness: My brother, R. C. Switzer.

The Court: I see. You are the inventor?

The Witness: No.

The Court: You are not the inventor of this. I see.

Mr. Ely: He is the vice-president, director of research, Switzer Brothers, Incorporated.

Your witness, Mr. Schimmel.

CROSS EXAMINATION by Mr. Schimmel.

Q. Mr. Switzer, just a question in connection with the Swiss patent. Do you have a copy before you? A. Yes. I do.

Q. Do you see paragraph 2 on the first page of that patent? A. Yes.

Q. Did you understand what is disclosed in that paragraph? A. I did.

Q. Did you carry out what is disclosed in that paragraph? A. You mean on the boiling oil test?

(58) Q. In the second paragraph on page one, did you do what that paragraph tells you to do?

The Court: Do you wish to address the Court?

Mr. Ely: Sir?

The Court: I thought I saw you rising.

Mr. Ely: I started to, but I did not understand Mr. Schimmel. I do not think the witness did, either.

Mr. Schimmel: The witness can answer for himself.

The Witness: Yes. I have done that so-called boiling test many times.

By Mr. Schimmel:

Q. I am talking about the second paragraph of page 1. I do not see any boiling oil in the second paragraph.

Mr. Ely: You mean the third paragraph.

The Witness: There is paragraph number 1 and then there is paragraph number 2, and it says the so-called boiling test.

By Mr. Schimmel:

Q. Let us look at paragraph 3, then. My mistake. Let us look at paragraph 3.

Did you carry out the disclosure of paragraph 3? A. Yes.

Q. Let me ask you, have you read the application involved in this proceeding? A. Yes. I have.

(59) Q. Do you recall whether there is a disclosure in this application of using nigrosine in alcohol as one of the penetrating solutions? A. Nigrosine and a high boiling alcohol, which would be an oily type alcohol.

Q. It says alcohol, does it not? A. It says high boiling.

Q. What alcohol did you use when you carried out the process of the Swiss patent? A. I used an ethyl alcohol aqueous type.

Q. Why did you use ethyl alcohol? A. Because it just says alcoholic solution, and when there is no other thing given other than alcoholic you assume it is natural alcohol.

Q. Will you look at page 2 of the Swiss patent, the last paragraph there are some alcohols disclosed in there, are there not? A. Yes.

Q. They are not ethyl alcohol, are they? A. No. They are not.

Q. Couldn't you have used those alcohols that are actually disclosed in the Swiss patent? A. You could if you want to continue experimentation.

Q. Wouldn't that have been a fair and reasonable interpretation of that disclosure?

(60) Mr. Ely: Your Honor, I raise a question as to the relevance of that question. I am not objecting to his going ahead.

The Court: If you wish to object I will rule. Are you objecting?

Mr. Ely: Yes. Because it is—

The Court: Are you objecting?

Mr. Ely: Yes.

The Court: On what grounds?

Mr. Ely: On the ground the defendant here is going into experimentation.

The Court: I do not want an argument. I want a ground for your objection.

Mr. Ely: It is irrelevant, Your Honor.

The Court: I think it is proper cross examination; permissible cross examination, anyway.

The Witness: What was the question, again?

Mr. Ely: Your Honor, may I request that Mr. Schimmel point out to the witness the paragraph to which he has reference?

The Court: You cannot make any such request.

Mr. Ely: They are referring to different copies.

The Court: Counsel may interrupt an examination only for noting a legal objection. You may answer.

The Witness: The butyl alcohol that was mentioned **(61)** was recommended as used with water, in combination with water. They do not specify anything other than alcoholic solution, or aqueous solution. They show the combination of alcohol and water and various other alcohols as a dilutant to the water to aid in their effect. They do not specify, nor teach in any way, or direct you to use high boiling alcohols alone.

The Court: You are repeating. You answered the question.

By Mr. Schimmel:

Q. May I direct your attention to the language—

The Court: That is a matter of argument.

Mr. Schimmel: I just want to get the exact statement in the disclosure of the Swiss patent in paragraph 3 of page 1.

By Mr. Schimmel:

Q. May I direct your attention to the statement in the patent, in the third paragraph, the middle of the paragraph, that good results can be obtained with the use of aqueous and alcoholic solutions or organic dyestuffs. A. Right.

Q. And I ask you if that would not mean to one skilled in the art an alcoholic solution of an organic dyestuff? A. That is what I prepared.

Q. And that alcoholic solution of an organic dyestuff, (62) would it be reasonable to interpret the butyl and alcohols on the second page as being one of those alcohols? A. I do not think so.

Q. You have testified with respect to the Switzer patent 2,259,400. May I ask you, aren't the materials disclosed there as fluorescent also colored materials? A. They have very weak colors. Some of them are absolutely colorless.

Q. Aren't some of them colored, and aren't they dyes? A. I say some of them are weakly colored, and some of them are colorless.

The Court: Mr. Schimmel, I think it will help the Court—

Mr. Schimmel: I am going to come to a specific part of the patent.

The Court: —if you call the Court's attention to a specific disclosure.

Mr. Schimmel: I am going to ask the witness to refer to column 2, page 2, of that Switzer patent.

The Court: Yes. You mean lines 5, 7, and 8; hot penetrating oils saturated with dyestuffs?

Mr. Schimmel: That is correct.

The Court: All right. Very well. That speaks for itself. Do you have anything further?

(63) By Mr. Schimmel:

Q. One other question with respect to the same patent. On page 4, in column 2, lines 5 to 7, is it not true that the developer there disclosed as useful as the second coating is the same as the developer used by the applicant in the instant application, and for the same purpose? A. It is the same. It is a similar developer, but it is not for the same purpose.

Q. Doesn't that developer bring out the dye, also? A. That developer reacts or brings out the fluorescent substance.

Q. Which may be a dye, is it not true? A. Which may be a dye as described; a fluorescent dye.

Mr. Schimmel: I think that is all, Your Honor.

Mr. Ely: I have some redirect to clarify that.

RE-DIRECT EXAMINATION by Mr. Ely.

Q. Mr. Switzer, referring to page 2 of the R. C. Switzer patent, down about line 55 or 56, where the patent, where it says:

> "And still other instances castings are treated with agents consisting of a hot penetrating oil saturated with dyestuffs which causes solutions to (64) become vividly fluorescent during exposure to black light."

That is the full statement in the patent, is it not? A. That is right.

Q. As the color of the penetrants—fluorescent penetrants disclosed in the Switzer patent, or any of those fluorescent dyes—do those dyes have color with respect to the surface of the test body as contrasted with just color in the body?

The Court: You may answer.

The Witness: No. They do not have strong color or contrasting colors. They are very weak washed out color in daylight. They have powerful fluorescent color under black light in the dark. That is what was meant by a fluorescent dye, one that has a powerful color luminescence under black light, and the specific dyes mentioned have that effect only.

By Mr. Ely:

Q. Exhibit 15-A is a test block with such a fluorescent penetrant on the surface, is it not? A. It is.

Q. And there is no showing of any color whatsoever on that, is there? A. You cannot see the color unless you were to take (65) it in the dark and examine it under black light.

Mr. Ely: That is all.

The Court: You may step down.

(Thereupon, the witness left the stand.)

The Court: Is that the plaintiff's case?

Mr. Ely: I call Mr. Robert Switzer.

Thereupon ROBERT C. SWITZER, the plaintiff, was called as a witness in his own behalf and, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION by Mr. Ely.

Q. Will you please state your name, residence, and occupation. A. My name is Robert C. Switzer, Shaker Heights, Ohio. I am president of Switzer Brothers, Incorporated, Cleveland, Ohio.

Q. Are you the Robert C. Switzer who was the inventor of the Switzer patent of reference in this suit? A. I am the inventor of this patent.

The Court: Just answer yes, if yes is the answer.

I am going to suggest this, there is no use having repetition testimony because I presume the Patent Office will not introduce any testimony.

(66) Mr. Schimmel: No oral testimony.

The Court: So suppose you confine this witness' testimony only to matters you did not bring out from the other witness.

Mr. Ely: I assure the Court this testimony has been designed for that purpose, not to have repetition.

By Mr. Ely:

Q. Are you the inventor of the application or the invention disclosed in the application in suit? A. Yes.

Q. Mr. Switzer, with respect to the earliest effective filing date of the Ward reference patent; that is, the water emulsifiable patent, fluorescent patent, which earlier date was in June 1942, when did you invent and reduce to practice the invention involved in this application in suit?

Mr. Schimmel: May I object to this, Your Honor, on the ground that it is foreclosed by the proceeding in the prior case. The antedating of the Ward patent was a matter which was in issue before the Court of Customs and Patent Appeals in prior application, and that court held it could not be antedated.

Mr. Ely: Your Honor, that is—

The Court: Just a moment please. I will give you an opportunity to answer before I rule.

Mr. Schimmel: May I refer, Your Honor—

(67) The Court: Are you referring to 236 Federal—

Mr. Schimmel: 236 Fed. 432, the last part of the decision, where they are referring to rule 131 of the Patent Office; the paragraph prior to that where—they speak there that appellants are not entitled to a patent containing the appealed claims unless they antedate the Ward patent.

The Court: Yes. But what has that to do—

Mr. Schimmel: They held he could not do so.

The Court: Why?

Mr. Schimmel: Because antedating only applies to subject matter that is disclosed but not claimed; and they held that the subject matter in issue was claimed.

The Court: Where is that?

Mr. Schimmel: In the next to the last paragraph.

The Court: What do you have to say?

Mr. Ely: Your Honor, the holdings, there were different parties involved in the case before it. It was a different application.

The holding there, Your Honor, was that the claims before the Court of Customs and Patent Appeals—the subject matter—had been also claimed in the Ward and Switzer application there in suit. No such issue has been made by the Patent Office below. Furthermore, that is a trial de novo. We have brought this matter up before and I wish to **(68)** reestablish it with further and additional evidence over and beyond that which was in the Patent Office.

The Court: Yes. I think in a trial de novo you have a right to offer additional evidence, which you cannot do in a Court of Customs and Patent Appeals, provided the evidence is admissible. Why isn't this evidence admissible?

Mr. Schimmel: I say it is inadmissible under the doctrine of where an issue has been tried in one case that forecloses the matter on that particular issue.

The Court: These are different claims, are they not?

Mr. Schimmel: These are claims to the same invention, essentially. The only difference is one of the claims —if Your Honor will look at the claims cited in the court's decision on the testing agent you will see there that there was claimed as the invention in that case a testing agent consisting of an oily material and a coloring agent.

The Court: I think this is a very close question, and while I have grave doubt as to whether the evidence is admissible I will let the plaintiff make his record.

The Witness: The answer to the question is I reduced the present invention to practice in late 1938.

The Court: 1948?

The Witness: 1938.

The Court: 1938.

(69) By Mr. Ely:

Q. I hand you here three documents. Will you please explain to the Court what they are. They have been marked Exhibits 16, A, B, and C.

(Thereupon, documents were marked for identification as Plaintiff's Exhibits Nos. 16-A, 16-B, and 16-C.)

A. These three documents consist of two letters from the General Dyestuff Corporation in reply to inquiries made of the General Dyestuff Corporation for oil-soluble dyestuffs. The third is an invoice from the General Dyestuff Corporation to me at my home in Cleveland, Ohio, covering a purchase of a non-fluorescent oil-soluble dyestuff. All of them are dated mid-1938. They were records kept—

The Court: Just a moment. You answered the question.

Mr. Ely: May I introduce these into evidence and, if it please the Court, may we use photostats?

Mr. Schimmel: I have no objection to the use of photostats, but I notice one of the exhibits, 16-A, does not mention Mr. Switzer's name.

The Court: That goes to the probative value.

Mr. Schimmel: I would assume that is incompetent in this particular case.

(70) The Court: Incompetent?

Mr. Schimmel: This one is. There is no reference at all to Mr. Switzer.

The Court: No. Let me see the exhibit.

Mr. Schimmel: 16-A, I have specific reference to, Your Honor.

The Witness: May I explain, sir?

The Court: You are just a witness. I am going to admit these. The probative value is highly doubtful but I will let the plaintiff make his record. They may be admitted.

(Thereupon, Plaintiff's Exhibits Nos. 16-A, B, and C, previously marked for identification, were received in evidence.)

By Mr. Ely:

Q. With respect to 16-A, whose handwriting, other than the signature of the letter, is that on there? A. That is all my handwriting.

Q. Will you explain to the Court how the letter happens to be addressed to Mr. Thomas A. Mulman?

The Court: I would like to see the letter. You may proceed.

The Witness: The letter is addressed to the Continental Lithograph Corporation, Division of Luminescents.

(71) The Court: We have it before us. It speaks for itself.

The Witness: In 1938 the Continental Lithograph Corporation was an exclusive licensee of ours. I was working in the Division of Luminescents. Mr. Thomas A. Mulman was the vice-president of the firm, a son of the president, and it was required that all correspondence out of the Division of Luminescents go out over his signature regardless of who dictated the letter.

I dictated the inquiry to which this letter is an answer. It may be because it had been signed by Mr. Mulman it was addressed to him. The longhand notes are notes which I made at that time of the chemical nature of the oil-soluble dyestuffs which the General Dyestuff Corporation was then submitting to me as samples. Also there in my handwriting are many notes concerning the solubility of these particular dyestuffs in oil, as well as notes concerning their color—their visible color.

By Mr. Ely:

Q. The subsequent letter and invoice is addressed to you at what was your home at that time? Is that not correct? A. At what was—yes.

Q. And where did you carry out your experiments with these oil-soluble dyestuffs? A. In my basement at home.

(72) Q. That was to carry out the inventions in suit. Is that correct? A. Yes.

The Court: We will take our usual mid-afternoon recess at this time?

(Thereupon, a short recess was had.)

The Court: You may proceed, gentlemen.

By Mr. Ely:

Q. Mr. Switzer, who was the actual author and who prosecuted the Switzer reference patent? A. I authored it.

The Court: Just a moment. You have got a double-barreled question. Suppose you reframe it to ask a single question.

By Mr. Ely:

Q. Who was the actual author and writer of the specifications and claims of the Switzer reference patent? A. I authored it.

The Court: Just a moment.
Mr. Schimmel: The patent speaks for itself. It is in the name of Mr. Switzer.
The Court: Objection sustained.
Mr. Ely: May we have Mr. Switzer's answer in order to have the exact meaning of the—
The Court: No. It makes no difference who wrote (73) the specifications; whether he wrote it himself or whether he had somebody do it for him is immaterial.

By Mr. Ely:

Q. Referring to both the Switzer reference patent and the Ward reference patent, what is the meaning of the word "fluorescent"? As used in those applications and particularly in context with the word "color" as used in the application in suit.

The Court: Why don't you ask a simple question? You have got so much in it that I would not know what part of the question the answer would be directed to. Of course, "fluorescent" is a dictionary term.

Mr. Ely: Yes.

The Court: Unless it is used in some special sense here. Suppose you reframe your question and make it more pointed.

By Mr. Ely:

Q. What is the meaning of the word "fluorescent" as used in the Switzer and Ward reference patents? A. The word means, and always has meant in this field of flaw detection, a material which will emit visible light in darkness during exposure to fluorescigenous radiant energy, such as black light. Generally speaking it also means materials which are employed in such a dilute fashion that they have no color in small quantities. No fluorescent **(74)** materials on test bodies which are used as indicators of tiny invisible cracks ever have any color which can be seen with the naked eye. This term "fluorescent" was originated by me.

The Court: You have answered the question. We do not want a history of the word, we want to know its meaning.

By Mr. Ely:

Q. And this is a word that has several dictionary meanings. What is the meaning of the word "color" as used in the application in suit? A. The word "color" is used in the application in suit to denote materials which have an intense tinctorial strength in daylight. It also denotes materials which, because of their required concentration, basically have no fluorescence in the form used; no detectable fluorescence.

The term "color" has been extensively adopted by the industry.

The Court: You have answered the question. Do not keep on lecturing.

By Mr. Ely:

Q. Summarizing your answer, then, the term "color" as used in this application in suit is synonomous with nonfluorescent. Is that correct? A. That is correct, sir.

(75) Q. Has this distinction between fluorescent penetrants and color or visible penetrants been recognized in the art? A. It has always been recognized and adopted by the art. There has never been any question about it in either industry or the military.

Q. What is the military recognition of that distinction? A. In the military specification, Exhibit 3-A, they are set up as two completely distinct types. On page 1 type 1 is defined as materials with fluorescence; type 2 is defined and carried throughout the specification as defining non-fluorescent materials and processes. On page 2 of the definition, specifically given—may I, first—

The Court: I think the exhibit speaks for itself. I have it before me.

By Mr. Ely:

Q. Let me ask you one more question about—you were speaking of the concentration of the dyes. According to the Ward patent in suit what is the desirable concentration of fluorescent ingredients or dyes? A. The Ward patent specifies that in general fluorescent materials in order to exhibit high fluorescence brightness in tiny microscopic quantity must be incorporated in very tiny concentration; in small concentration.

Q. That patent points out if you concentrate the dyes such as— (76) A. If you concentrate the dyes you destroy fluorescence. The application in suit states, as I recall, that in general these color dyestuffs must be used in proportions up to approximately 10 per cent.

Q. As between the fluorescent systems of the Switzer and Ward patents, and the non-fluorescent color system of the invention in suit are the two systems fully interchangeable in use? A. Not at all. No.

Q. Will you please explain to the Court the difference and fields of use? A. The fluorescent system is very extensively used in industry and by the military in installations where it is possible to set up production lines that include inspection conditions that are darkened. Such inspection booths and inspection areas require elaborate lighting equipment. The color system, on the other hand, is ideally suited to use as, for example, in oil fields for the testing of oil drills; in aircraft maintenance yards for testing of aircraft parts; and railroad yards for testing of wheels, for example, where there is no possibility of darkening the area or supplying the various complicated fluorescigenous radiant energy that is required in the fluorescent system.

Q. Thank you. Now, the Patent Office found that there was common ownership between the Ward patent in suit (77) and the application in suit. Is that correct? A. Absolutely.

The Court: No. I am going to exclude that.

Mr. Schimmel: Objection.

The Court: That is not the way to ask the question. You have a right to ask him who was the owner of the various applications.

By Mr. Ely:

Q. Who owns the Ward reference patent? A. The patent is owned by Switzer Brothers, Incorporated.

Q. That is as of now? A. As of December, 1955. It was assigned to the corporation. Prior to that time it had been owned by four people; my brother Joe, myself, and our two respective wives, in a co-tenancy, which prohibited any one of the four from in any way transferring any rights or making any agreement whatsoever concerning any of the rights in the patent without the express written consents of all others.

The Court: The Court of Custom and Patent Appeals held it is immaterial whether the ownership of the Ward patent and the application—did not hold it was material; but the ownership was not controlling; so what difference does it make whether there is common ownership or not? (78) There is common ownership in part, isn't that—

Mr. Ely: No, sir. That is one of the differences between this case and the case that was before the Court of Customs and Patent Appeals.

The Court: Very well. Prove your ownership, briefly. Who owns the application in suit?

The Witness: I do, sir.

The Court: You also own an interest in the Ward patent?

The Witness: Our corporation owns the Ward patent.

The Court: What percentage of the stock do you own in the corporation?

The Witness: I own 50 per cent.

The Court: Does your wife own any part of it?

The Witness: No, sir.

The Court: Who owns the other 50?

The Witness: My brother Joseph.

The Court: In other words, you have a half interest in one application, and 100 percent interest in another?

The Witness: I have a —

The Court: A half interest through the corporation. I think that simplifies that.

Mr. Ely: There is one distinction here.

By Mr. Ely:

Q. Have you ever been able to utilize or otherwise (79) operate under the Ward patent without the consent of your brother Joseph?

The Court: I am going to exclude that.

By Mr. Ely:

Q. Has your brother Joseph ever had any rights with respect to the application in suit which would in any wise encumber—

The Court: I am going—

Mr. Ely: —the use or licensing of it?

The Court: He says he owns the application, and said that in answer to the Court's question.

By Mr. Ely:

Q. If one practiced the invention as disclosed and claimed in the application in suit would there be any basis for infringement of the claims of either the Switzer patent or the Ward patent?

Mr. Schimmel: May I object to that, Your Honor?

The Court: Objection sustained.

Mr. Ely: Your Honor, that is why I would like to come back, if possible, because Mr. Switzer is the author and prosecutor of these claims, is fully qualified—

The Court: That is not a question. I do not doubt the witness's qualification as an expert, but this is not a matter for expert testimony.

Mr. Ely: I think it will be brought out—

(80) The Court: This is not a matter for expert testimony. I have ruled. That is the question for the Court to determine. If it were relevant it would be a matter of law for the Court, or a mixed question of law and fact.

Mr. Ely: I would like to bring out this witness and plaintiff acted as his own attorney in the prosecution of these applications.

The Court: What difference does it make?

Mr. Ely: Because under those circumstances, it seems to me, that just as an attorney is entitled to answer a question as to the scope of infringement, a man who acts as his own—

The Court: No. That does not make him his own attorney. No. I ruled. You may proceed.

Mr. Ely, I wonder if you would mind my asking you—in no critical sense—if you would not walk up and down; it is rather disconcerting for my eyesight. Try and stand in one place.

Mr. Ely: I will try not to be disconcerting, or disconcerted, Your Honor.

By Mr. Ely:

Q. The Patent Office has taken the position that if one followed the disclosure of the Swiss patent—

The Court: Please do not tell him what the Patent Office has done. You may ask him questions, and do not forget **(81)** you cannot elicit answers to questions of law under oath. He is a witness. You may proceed.

By Mr. Ely:

Q. If one combined the use of an absorbent developer, as suggested in your basic fluorescent patent, and combined it with the steps and procedures disclosed in the Swiss patent, would one secure a visible penetrant system of inspection as you have claimed in this application in suit? A. Absolutely not. By the Swiss method we have found no flaws other than those which are visible prior to testing.

Q. What is the action of the Swiss procedure with respect to the chemical solution suggested in that reference?

The Court: Haven't you been over that with the preceding witness?

Mr. Ely: No, sir; not in one aspect, if you please.

The Court: Very well. Just answer briefly.

The Witness: The Swiss recommend aqueous or alcoholic solutions. In the first place, it is very questionable—

The Court: No. Just answer questions without any comment.

The Witness: —aqueous or alcoholic solutions which are penetrants. They likewise are very probably caused to remain in flaws, particularly fine flaws, if they do penetrate, because of the high rate of evaporation. **(82)** Similarly the Swiss require the use of liquid for cleaning which wash the fluorescent indications out of the flaws if there are any.

A fatal error in the Swiss specification is a recommendation that the part be cleaned with materials which will destroy an aqueous or alcoholic-carried fluorescent composition.

By Mr. Ely:

Q. One final question. Did you have any opportunity of any nature or kind whatsoever to be aware between February 1943 and June 1945 of what patents were published by the Swiss Patent Office, assuming that such patents were published? A. No.

Mr. Schimmel: Objection.

The Court: I consider it irrelevant; but I am going to let him make the record. He has answered "no."

The reason I consider it irrelevant is because of the ruling of the Court of Customs and Patent Appeals in the case of the Ward application, 236 F. 2d 428, at page 430. The same question came up and the court held that:

> "We are in agreement with the Board that the patent statutes make no distinction as to the availability to residents of the **(83)** United States of a regularly issued and published foreign patent."

I will let you make a record. I have let you make the record by letting you answer the question, and he said "no." Even though I ruled it is irrelevant.

Mr. Ely: That is all I have of this witness.

I would like to ask Your Honor a question.

Am I precluded by the ruling now from making my argument in that case?

The Court: No. I will let you make your argument. You are not going to have long cross-examination?

Mr. Schimmel: No. Just a couple of questions.

CROSS EXAMINATION by Mr. Schimmel.

Q. Mr. Switzer, you filed this application involved in this suit as the sole inventor of the subject matter described and claimed therein, did you not? A. Yes. I filed the application as sole inventor of the claims in suit. The specification was copied practically verbatim from the joint Switzer and Ward case. The claims are quite different.

Q. When you filed this present application you made oaths to the fact that you were the sole inventor of what was described and claimed therein, did you not?

(84) The Court: Yes, he did. The record shows that.

The Witness: I am sure of that. Yes.

By Mr. Schimmel:

Q. You also did the same thing, did you not, when you filed a joint application; you made oath to the fact that you were the joint inventor of everything described and claimed therein, did you not? A. I am not sure, Mr. Schimmel, whether the patent oath states that you are the original inventor of everything described in a patent application. I certainly swore that I was the sole inventor of the subject matter claimed in the present application.

Q. When you filed the joint application what did you swear to there? A. That I was a joint inventor with Mr. Ward of the subject matter contained in the joint application.

Q. But not described? A. I do not know whether the Patent Office form states that inventor claims everything he describes, or not. I do not know.

Q. The two specifications are essentially identical, are they not? A. The two specifications essentially identical. Right.

Mr. Schimmel: That is all.

(85) The Court: You may step down.

(Thereupon, the witness left the stand.)

The Court: The plaintiff rests?

Mr. Ely: The plaintiff rests.

Mr. Schimmel: The defendant has to offer, Your Honor, the exhibit which is on your desk, including as the exhibit, A to F.

I would also like to offer as Exhibit G the transcript of record before the Court of Customs and Patent Appeals in the joint application of Richard Ward and Robert Switzer, Serial Number 606,708.

Mr. Ely: Objection, Your Honor. That is irrelevant. That is not the case before the Court.

The Court: I am going to overrule the objection. I am letting each party make their record. I doubt the relevancy, but this not being a jury trial, a non-jury case, I always lean in favor of more liberal application of the rules of evidence than in jury cases.

Mr. Schimmel: That is all the defendant has to offer.

The Court: Very well.

(Thereupon, documents were marked for identification as Defendant Exhibits Nos. 1-A through G, inclusive and were received in evidence.)

* * * * *

(106) The Court: I have here the evidence on that issue. This is a trial de novo. I am not bound by affidavits; and I would find as a fact that there is not sufficient evidence to justify the finding that Switzer antedated the Ward patent because his oral testimony has not been sufficiently **(107)** corroborated; and I think the law requires corroboration.

I do not question his veracity, but his veracity has nothing to do with my ruling. I think the law is clear that date of concept of an invention cannot be established by the uncorroborated oral testimony of the inventor; and I do not consider these three documents corroboration because they are too ambiguous.

* * * * *

(110)

ORAL RULING OF THE COURT.

The Court: This is an action under Title 35, United States Code, Section 145, to secure an adjudication that the plaintiff is entitled to receive a patent on certain claims in an application for a patent, serial number 85,749, filed April 16, 1949. The alleged invention relates to methods of testing materials without destroying them.

The present applicant obtained a patent on one such method, Number 2,259,400, issued on October 14, 1941. That method consisted of applying a fluorescent liquid to the test surface and after this liquid penetrated the surface it would be removed from the surface but not from any cracks or flaws which appeared in the surface no matter how minute because the liquid would have penetrated those cracks and flaws. The test surface would then be inspected in a dark room under radiation such as black light which caused the penetrant liquid to fluoresce and render any cracks or flaws in the surface visible.

The steps that the applicant took in his present application was to substitute a solution of ordinary colored dye for a fluorescent dye, and using, preferably, an oily liquid mixed with the dye. The advantage of the further step is that instead of having to inspect the surface that was being tested in the dark or under black light it could be inspected under ordinary light because the cracks or **(111)** flaws would become visible to the naked eye. This step, however, was suggested in a Swiss patent, 224,242, published on February 1, 1943. That patent suggests the use of organic dyestuffs for the purpose for which the present applicant is using his liquid containing ordinary colored dye.

The Patent Office held, and the Court agrees, that in the light of this disclosure the step taken by the applicant in this case does not represent the exercise of the inventive faculty, but, rather, an exercise of ordinary mechanical skill.

It is immaterial whether the Swiss patent is operative or whether it gives sufficient details as to how to operate the process to which it refers. These considerations would be important if the Swiss patent were cited as an anticipation. It is merely cited, however, as a disclosure in the prior art for the purpose of inferring and leading to the conclusion that the additional step taken by the applicant did not involve the exercise of the inventive faculty. This very question was determined by the Court of Customs and Patent Appeals in the case of Application of Ward, 236 F. 2d 428, 430.

Irrespective of any question of res judicata this Court feels the discussion of the Court of Customs and Patent Appeals is very persuasive and will be followed as an authority. That court said:

> **(112)** "The use of a luminescent testing agent in a process similar to that here is shown in the Switzer patent and the use in a similar process of a testing agent including a substance having a color contrasting with that of the test body is also disclosed by the Swiss patent."

And the Court continues to say that it thus appeared,

> "The prior art disclosed the use of both luminescent testing agents and agents containing a coloring substance contrasting in daylight with the color of the test body."

Under these circumstances we agree with the statement of the Board.

> "That we see nothing inventive in substituting a colored material for such as is shown by Farben industries for the luminescent or fluorescent material employed by Ward."

It has been argued here that the Swiss patent should not be considered as a part of the prior art because it was not available in this country during the war. Actually, there is no proof whether it was or was not **(113)** available in this country. It must be borne in mind that Switzerland was neutral and that there was mail communication between the United States and Switzerland even during the war. But irrespective of that the Court of Customs and Patent Appeals, in the case already referred to, passed on this very point and held that the patent statutes make no distinction as to the availability to residents of the United States of a regularly issued and published filing and patent and that the Swiss patent was therefore a proper reference.

This disposes of claims 3 and 4 that are here in suit. Claim 11 that is also in suit contains a slight difference, which, however, is covered by a patent to Ward, 2,405,078, issued on July 30, 1946.

It should be observed that the Ward patent is in part owned by the plaintiff in this case, and this case, therefore, so far as claim 11 is concerned, would represent a forbidden instance of double patenting. But quite irrespective of that, even treating the Ward patent purely as prior art, it is clear that claim 11 does not constitute an invention, bearing in mind all of the three items of the prior art that have been discussed heretofore.

It also occurs to the Court that what the plaintiff has been trying to do, and there is no intent to criticize him, was to extend the monopoly that he would get under the patent laws for a period somewhat longer than (114) the patent laws provide by, first, the Ward patent, and then an attempt to get a later patent in this case. The law does not permit the accomplishment of such a purpose.

The Court concludes that the Patent Office was correct in reaching the conclusion that the claim in suit covers a method that does not represent the product of the inventive faculty rather than of mechanical skill.

In the light of these considerations the Court will render judgment for the defendant on the merits.

Counsel may submit proposed findings of fact and conclusions of law.

(Thereupon, the instant matter was concluded.)

FINDINGS OF FACT AND CONCLUSIONS OF LAW.

(Filed March 12, 1957.)

FINDINGS OF FACT.

1. This is a civil action brought under the provisions of Section 145 of Title 35 of the United States Code in which the plaintiff, Robert C. Switzer, seeks a judgment from this Court authorizing the defendant, Commissioner of Patents, to grant letters patent of the United States based upon certain claims of the patent application of said Switzer, Serial No. 85,749 filed April 6, 1949 entitled "Flaw Detection."

2. The claims in suit, as appears from paragraph VI of the complaint, are numbered 3 to 11 inclusive in the aforementioned patent application.

3. Claims 5, 8 and 10 were withdrawn by plaintiff at trial.

4. Claims 5, 6 and 9 were refused by defendant solely on the ground that they are for species of the alleged in-

vention different from that elected for prosecution in the absence of an allowable generic claim, under Patent Office rules; hence said claims are not before the Court on their merits.

5. Claims 3, 4 and 11 are at issue on their merits.

6. The alleged invention relates to a non-destructive method of detecting subsurface flaws in substantially solid bodies, and it is asserted to be an improvement over the method described and claimed in plaintiff's Patent No. 2,259,400 granted October 14, 1941. That method consisted of applying to a cleaned surface a solution of a material capable of exhibiting luminescence, and then inspecting or viewing the coated body, after removal of the excess testing material, in a darkened location under "black" or ultra violet light.

7. The step that plaintiff took in the present case was to substitute a solution of an ordinary dye for the luminescent material, using preferably an oily liquid as the carrier therefor, the advantage of this step being that instead of being required to use "black" light for inspection, the test body could be viewed in ordinary light.

8. Swiss Patent No. 224,242 published February 1, 1943 discloses a non-destructive method for detecting subsurface flaws, in which the test body is immersed in a solution of a coloring agent, i.e., organic dyestuffs, which is visible under daylight conditions. The body is then rinsed and dried, after which the coloring agent exudes from the flaws, thereby giving an indication of their position. This patent is part of the prior art.

9. The Ward Patent No. 2,405,708 granted July 30, 1946 on an application filed April 18, 1944 describes and claims a process of non-destructive testing using a water-emulsifiable luminescent testing agent which may be washed from the surface of the test body with water; it is said to be an improvement over the process of Switzer Patent No. 2,259,400.

10. The Ward patent is in part owned by plaintiff in this case, but nevertheless it is part of the prior art.

11. Plaintiff's evidence submitted to show that plaintiff antedated the Ward patent was insufficient. The documentary exhibits are too vague and indefinite, and the testimony of the plaintiff lacks the required corroboration.

12. In the light of the disclosure of Swiss Patent No. 224,242 of February 1, 1943, the step taken by plaintiff constitutes only mechanical skill, not invention.

13. Claims 3 and 4 do not define invention in view of the prior art; i.e., Switzer Patent No. 2,259,400 and Swiss Patent No. 224,242.

14. Claims 3 and 4 are unpatentable.

15. Claim 11 defines nothing inventive over the Ward patent, bearing in mind all items of the prior art.

16. Claim 11 defines subject matter which represents double patenting in view of the Ward Patent No. 2,405,078.

17. Claim 11 is unpatentable.

CONCLUSIONS OF LAW.

1. Testimony offered to show that the disclosure of Swiss Patent No. 224,242 does not give sufficient details and is inoperative, is immaterial, since the foreign patent is not relied upon as an anticipation, but is cited only to show the state of the art.

2. Swiss Patent No. 224,242 published in 1943 was part of the prior art and a proper reference, notwithstanding that Switzerland was surrounded by enemy countries at the time.

3. One seeking to antedate a patent which is part of the prior art must establish the earlier date with certainty and the evidence presented must be corroborated.

4. Plaintiff is not entitled to a patent containing any of the claims set out in paragraph VI of the complaint.

5. Plaintiff is not entitled to a patent containing any of claims 3 to 11 inclusive based upon the patent application of Robert C. Switzer, Serial No. 85,749, filed April 6, 1949 involved in this proceeding.

6. The complaint should be dismissed as to all the claims set forth in paragraph VI of the complaint.

/s/ ALEXANDER HOLTZOFF,
Judge.

March 12, 1957.

JUDGMENT.

(Entered March 12, 1957.)

This action came on to be heard at this term, and thereupon upon consideration thereof, it is this 12th day of March, 1957

ADJUDGED that the complaint be and is hereby dismissed, with costs against the plaintiff.

/s/ ALEXANDER HOLTZOFF,
Judge.

NOTICE OF APPEAL.

(Filed April 11, 1957.)

Notice is hereby given under Rule 73(a), Federal Rules of Civil Procedure, that Robert C. Switzer, plaintiff, hereby appeals to the United States Court of Appeals for the District of Columbia Circuit from the judgment entered in the above case on March 12, 1957.

BRIEF FOR APPELLANT.

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT.

United States Court of Appeals
For the
District of Columbia Circuit
FILED SEP 6 1957
Joseph W. Stewart
CLERK

Appeal No. 13,948.

ROBERT C. SWITZER,
Appellant,

vs.

ROBERT C. WATSON,
Commissioner of Patents,
Appellee.

APPEAL FROM JUDGMENT OF
THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA.

ALBERT L. ELY, JR.,
ELY, PEARNE & GORDON,
912 Midland Building,
Cleveland 15, Ohio,
Attorneys for Appellant.

THE GATES LEGAL PUBLISHING CO., CLEVELAND, OHIO—MAIN 1-5647

STATEMENT OF QUESTIONS PRESENTED.

The principal questions presented by this appeal are:

(1) Is a patent claim properly refused on the ground of double patenting over the claims of a co-pending issued patent where the claims sought and the patented claims are mutually exclusive?

(2) What corroboration, if any, is needed to establish that an inventor made his invention before the application date of a patent cited as a reference when (a) the inventor so testifies, (b) offers correspondence showing acquisition of materials to carry out his invention, (c) there is not contradicting evidence, and (d) the Court has no doubts as to the inventor's veracity?

(3) Are those having ordinary skill in the art at the time an improvement is made expected to have knowledge of and experiment with the disclosures of later-issued inoperative foreign patents?

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United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT.

Appeal No. 13,948.

ROBERT C. SWITZER,
Appellant,
vs.
ROBERT C. WATSON,
Commissioner of Patents,
Appellee.

APPEAL FROM JUDGMENT OF
THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA.

BRIEF OF APPELLANT.

JURISDICTIONAL STATEMENT.

This is an appeal from the judgment of the District Court below (App. p. 47a) dismissing appellant's complaint for issuance of a patent upon an application duly filed in the United States Patent Office (Complaint, App. p. 1a). The Court below was vested with jurisdiction under Title 35, United States Code, Section 145. This Court is vested with jurisdiction to entertain this appeal under Title 28, United States Code, Section 1291, this appeal having been noticed on April 11, 1957 (App. p. 47a) from said final judgment dated March 12, 1957, i.e., within the thirty-day period prescribed by Rule 72, Federal Rules of Civil Procedure.

STATEMENT OF CASE.

The invention in suit relates to a visible penetrant method of non-destructive testing, that is, a method by which the *existence* and *location* of minute cracks and flaws starting at the surface in mechanical parts ["test bodies"] may be readily detected by the naked eye in ordinary light, even though the crack openings themselves are very minute and invisible. The method has become an accepted standard method of production in industries, such as the aircraft industry, where such flaws, which may be the seed or starting point for failure of a part in service, cannot be tolerated in highly stressed parts or highly stressed areas of structures. See the Government Military Specification, plaintiff's Exhibit 3.

Summarizing the invention as defined in one of the two claims which the Patent Office has allowed to appellant (Claims 1 and 2, page 19 of the application in suit, Pl. Ex. 1), the method comprises the following steps:

(1) Applying to the surface of the test body an oil-containing solution of coloring material [oil-soluble dyes];

(2) maintaining the solution on the surface a sufficient period of time to permit the solution to penetrate the openings of any flaws that may be present;

(3) removing from the surface the solution that has not penetrated the flaws.

(4) applying to the surface a powdered ["finely divided"] absorbent material.

As stated in the allowed claims, if any flaws are present, their location is revealed by the coloring of the absorbent material by the dye contained in the portion of the solution that had penetrated into the flaw openings and seeped out after the surface had been cleaned and the absorbent material had been applied.

Three unallowed claims were put in issue in the trial below, namely, claims 3, 4, and 11 (App. pp. 2a-3a).

The process called for in claim 3 differs from that called for in the allowed claim 1, as outlined above, in two respects: (i) the solution to be applied to the article is specified as "a solution containing a penetrant and a coloring matter therefor" rather than "a solution containing an oil and a coloring material"; (ii) instead of the "finely divided absorbent material" called for in claim 1, claim 3 calls for the use of "a second coating solution which absorbs the coloring matter of the first solution retained in and about the surface openings of the flaws."

Claim 4 is dependent upon and subsidiary to claim 3 and merely further specifies that the second solution is colored to provide a contrasting background for the first solution that is absorbed into the second solution.

Claim 11 differs from claims 1 and 3 in that it does not call for the use of an absorbent material to develop the indication of the flaws. Rather, it specifies a testing agent comprising an oily liquid capable of wetting the surface of the test body and a dissolved dye selected to impart to the testing agent a color distinctive from the color of the surface of the test body, whereby—after this oily colored testing agent has been applied and removed as in claim 1 and the article is inspected in *visible* light—"the extent and location of the flaws will be revealed and magnified by the color contrast between the exuded testing agent and adjacent areas of the test body."

In short, the invention in question is practiced preferably with an oily, colored penetrating agent and an absorbent developer (allowed claim 1) but may be varied. The testing agent need not be an oily solution of the dye, provided that it is a penetrant solution of the dye and provided that a contrastingly-colored absorbent liquid developer is used (claims 3-4). Or the absorbent developer may be omitted if the penetrant is an oily dye solution that wets the surface of the test body and such oily solution itself is contrastingly-colored with respect to the surface when it seeps from the flaw openings and thereby magnifies and reveals the location of the flaws by color contrast.

Claims 3 and 4 were rejected in the Patent Office on a Swiss patent to I. G. Farbenindustrie carrying a Swiss patenting date of February 1, 1943, in the light of appellant's own patent, No. 2,259,400 (Board of Appeals decision, page 3, paper No. 21, plaintiff's Ex. 1). The Swiss patent was not received in the United States Patent Office until August 29, 1946 (App. p. 8a; Pl. Ex. 2), i.e., after the July 23, 1945 filing date of the parent application, Serial No. 606,708, from which the present application was divided and filed as a continuation (Specification of the application in suit, page 18, Pl. Ex. 1).

The Swiss patent proposes, as summarized in Finding of Fact 8 (App. p. 45a), "a non-destructive testing method for detecting sub-surface flaws, in which the test body is immersed in a solution of a coloring agent, i.e., organic dyestuff, which is visible under daylight conditions. The body is then removed and dried after which the coloring agent exudes from the flaws, thereby giving an indication of their position." The witness Joseph Switzer testified that the solutions proposed by the Swiss patent were aqueous, not oily or oil-containing (App. p. 24a). The process as proposed in the Swiss patent was inoperative, even under experiments employing organic dyestuffs alternately suggested by the Swiss patent in place of the inorganic chromate solutions of the specific example recited in the Swiss patent (App. pp. 9a-14a; Pl. Exs. 4-10). The Trial Court understood appellee did not rely, at the trial, on the Swiss patent as an anticipation of the claims in question but merely as a disclosure in the prior art (App. p. 10a); in the Oral Ruling, the Court stated:

> "It is immaterial whether the Swiss patent is operative or whether it gives sufficient details as to how to operate the process to which it refers. These considerations would be important if the Swiss patent were cited as an anticipation. It is merely cited, however, as a disclosure in the prior art for the purpose of inferring and leading to the conclusion that the additional step taken by the applicant did not involve the exercise of the inventive faculty." (App. p. 42a.)

The process of appellant's prior patent, No. 2,259,400, is summarized in Finding of Fact 6:

> "That method consisted of applying to a cleaned surface a solution of a material capable of exhibiting luminescence, and then inspecting or viewing the coated body, after removal of the excess testing material, in a darkened location under 'black' or ultra violet light." (App. p. 45a.)

The specification of the application in suit points out that the present invention overcomes several short-comings of the appellant's fluorescent method. The fluorescent method cannot be used, as the present method can be, where the articles to be inspected are too bulky to be inspected under the requisite darkened conditions or where neither the special equipment nor power for the requisite fluorescigenous radiations is available. In eliminating the need for such special radiation equipment, the present invention also eliminates a source of distraction for the operators using the fluorescent method, namely, the strain on their eyes caused by the fluorescence of their eyeballs (Specification, pages 2 and 3, Pl. Ex. 1).

The Trial Court understood the present invention as involving but a substitution of a solution or an ordinary colored dye for a fluorescent dye in the fluorescent method (Oral Ruling, App. p. 42a). The witness testified without contradiction that the fluorescent method and the present invention involve entirely different phenomena and that no one would expect, from the minute and invisible (in ordinary light) amounts of fluorescent penetrant retained in the flaws in the fluorescent method, that there could be enough volume of colored penetrant retained in a flaw opening to produce any kind of indication visible in ordinary light (App. p. 22a).

There was no finding, either in the Findings of Fact or the Oral Ruling, that either the Swiss patent or the appellant's earlier patent, No. 2,259,400, suggested the use of the absorptive developing solutions called for in claims 3 and 4 (App. p. 17a).

Claim 11 was found unpatentable only in view of a Ward patent, No. 2,405,078, issued July 30, 1946, upon an application filed April 18, 1944 and co-pending with the parent application, No. 606,708, from which this application in suit was divided. The disclosure of the Ward patent is summarized in Finding of Fact 9 as follows:

> "9. The Ward Patent No. 2,405,708 granted July 30, 1946 on an application filed April 18, 1944 describes and claims a process of non-destructive testing using a water-emulsifiable luminescent testing agent which may be washed from the surface of the test body with water; it is said to be an improvement over the process of Switzer Patent No. 2,259,400." (App. p. 45a.)

The Court understood that by the application in suit appellant was attempting to extend the monopoly of the Ward patent which was in part owned by appellant and that claim 11 constituted double patenting of the Ward invention (Oral Ruling, App. p. 42a), Finding of Fact 16, App. p. 46a). The appellant, as a witness, testified that the fluorescent materials disclosed and claimed in the Switzer and Ward patents would not exhibit the color requisite in the instant invention and that the color material or dyes called for in the claims in suit would not be understood in the art to encompass the fluorescent or luminescent dyes called for in the Ward and Switzer patents (App. pp. 33a-34a). The witness Robert C. Switzer, appellant, testified that he made the invention in suit in 1938 (App. 29a), i.e., before the application date of the Ward patent; he offered documents to corroborate his testimony, which was cut short by the Court (App. p. 32a). The Court later expressed no doubts as to the witness' veracity on this point, but held that the documents which were received (Pl. Ex. 16a, b, c) were insufficient corroboration (App. p. 41a).

STATUTES AND RULES INVOLVED.

The relevant sections of the Patent Statute involved in this appeal appear to be Title 35, §§ 101, 102(a) and (b), 103, and 120.

The standards of the Patent Office, for the showing necessary to antedate a reference which is not a statutory bar to a patent are set forth in Patent Office Rule 131(a) and (b).

Because of the length of the statutes and rule involved, they are set out in an appendix, hereto attached, as required by Rule 17(c)(6).

STATEMENT OF POINTS.

The points of error upon which appellant relies are as follows:

1. The District Court erred in holding that appellant did not sufficiently corroborate his testimony that he antedated the Ward patent by making the invention in suit before the filing date of the Ward patent.

2. The District Court erred in not construing the claims of the Ward patent and claim 11 in holding that claim 11 in suit constitutes double patenting of the Ward patent.

3. The Court erred in basing the holding of double patenting upon appellant's part ownership of the Ward patent.

4. The Court erred in construing the Swiss patent as a showing of the state of the art at the time of the invention of claims 3 and 4.

5. The Court erred in disregarding specific limitations in claims 3 and 4 in holding that these claims do not define patentable invention.

6. The Court erred in relying upon an inoperative foreign patent as a reference and in holding that it disclosed subject matter merely suggested for experiment.

7. The Court erred in refusing to hear witnesses' explanation of the invention and the reference and in demanding that the trial be run at "express train" speed.

SUMMARY OF ARGUMENT.

There is no double patenting of the claims of a later-issued patent or of a pending application over an earlier patent if the later claims do not "cross-read" on the earlier claims. There is no extension of a monopoly of an earlier patent by later claims if the earlier and later claims are mutually exclusive; that is, if practice of the invention covered by the earlier patent does not infringe the later claims and if the practice of the invention covered by the later claims does not infringe the earlier claims.

The Ward patent is not a statutory bar to appellant's claim 11. Appellant is entitled to an effective filing date prior to the issuance of the Ward patent.

Ownership of an interest in a parallel patent does not bar an applicant from antedating that patent as a reference; corroboration of testimony of unquestioned veracity need not be completely detailed.

With respect to the Swiss patent cited, not as an anticipation of appellant's invention as defined in claims 3 and 4, but as showing the state of the art, said patent is ineffective as a reference. The obviousness or non-obviousness of appellant's invention is to be judged by the state of the art at the time it was made, which was long prior to the availability in this country of the Swiss patent or even its presumed date of patenting in Switzerland.

The inoperativeness of the disclosure of the Swiss patent is not irrelevant to the obviousness or non-obviousness of appellant's invention, as called for in claims 3 and 4. If the inoperative disclosure of the Swiss patent had been available to the art at the time appellant made his invention, its inoperativeness, both as to what was definitely disclosed and what was suggested for experimentation, would have discouraged one of ordinary skill in the art from further speculation and experiment. Being later than the time when appellant's invention was made, the inoperative Swiss patent demonstrates that appellant had succeeded while others skilled in the art were still failing.

ARGUMENT.

Claim 11.

As is evident from the foregoing, the three claims on appeal fall into two groups, claim 11 and claims 3 and 4. Because the rejection of claim 11 seems to be based on the most clearly untenable grounds, it will be discussed first.

The Court's misconception that appellant is attempting to extend the monopoly secured by the Ward patent (App. pp. 43a-44a) plainly stems from the haste with which the trial was conducted and the consequent failure to consider the scope of the claims involved or even to listen to the witnesses' explanation of the scope of the claims of the Ward patent (App. pp. 21a, 37a). Even a cursory examination of the claims of the Ward patent (Def's. Ex. B) shows that those claims are restricted to the use of a particular emulsifiable penetrant, which is not involved in any of the claims here (Board of Appeals decision, p. 4, paper No. 21, Pl's. Ex. A). More significantly and distinctively, the claims of the Ward patent (and the Switzer patent too) are limited to the use of a luminescent testing agent, whereas the claims here on appeal all call for the use of a testing agent having ordinary color, i.e., non-fluorescent color (App. p. 33a).

Thus, it is clear that anyone practicing the methods or using the testing agents disclosed and claimed in the Ward patent would not infringe the claims on appeal here. When the Ward patent has run its term, use of the Ward method and testing agent will not be hampered by claim 11 or any other claim of this patent. There will be no extension of the monopoly secured by the Ward patent. By the same token, the claims of Ward patent do not cover the non-fluorescent testing method disclosed and claimed in the application in suit. The claims of the Ward patent and the application in suit are mutually exclusive. They do not "cross-read." Without "cross-reading," there can be no double patenting. See *Standard Brands v. Federal Yeast Corp.*, 38 F. 2d, 329, 344, and *Application of Stanley,* 214 F. 2d, 151 (CCPA 1954) in which the matter of double patenting and relevant authorities are discussed at length, at pages 153 to 157 of the decision.

In addition to the objection of double patenting advanced against claim 11 in the Oral Ruling of the Court, the objection that claim 11 advances no patentable subject matter over the Ward patent is added by Finding 16 (App. p. 46a). This finding begs the question of whether or not the Ward patent is prior art and an available reference with respect to the application in suit. Manifestly it is not. The application in suit is a continuation of an earlier-filed application, No. 606,708, filed jointly by appellant and his co-worker Ward. In order that the claims of the instant case could not issue in a patent granted to the two inventors, this sole application was divided out after the question of the actual inventorship of particular subject matter was reconsidered in the course of prosecution of the earlier-filed application. Being derived from the earlier application, No. 606,708, having a substantially identical specification (App. 4a), the present application is entitled to an effective filing date carrying back to that of its parent application, namely, July 23, 1945. 35 U. S. C. 120. The Ward patent, therefore, cannot meet the terms and conditions of prior art as defined in 35 U. S. C. 102(a) and (b) if appellant has shown that he made his invention before the filing date of the Ward patent.

While the trial Court stated that it had no doubts as to the veracity of the appellant who, as a witness, testified that he reduced the invention in suit to practice in 1938 and started to show the records of his work (App. pp. 29a-32a), the Court felt that the records offered did not constitute the corroboration which "the law requires" (App. 41a).

This disregard of appellant's accepted testimony raise the apparently novel question of what degree of corroboration is required of an applicant for a patent to antedate a reference cited against him where the reference was not a patent or publication more than a year prior to the applicant's effective filing date. No judicial decision establishing this standard of corroboration has been found in cases where the question of an inventor's antedating another patent has been involved. But there are ample decisions establishing the degree of corroboration needed where a parallel question has been involved, namely, the degree of corroboration required for oral testimony of a prior use which would antedate a patented invention. For that proof, oral testimony alone is sufficient if it is convincing. See *Borklund v. Peterson* (CA 7, 1957), ____ F. 2d, ____, 113 U. S. P. Q. 401, 403 and the authorities cited therein, such as *Whiteman v. Mathews* (CA 9, 1954), 216, F. 2d, 712, 716.

The Patent Office sets no different or higher standard of corroboration where an applicant is permitted to antedate a reference by affidavit under Rule 131, Patent Office Rules of Practice. Rule 131(b) merely requires that "The showing of facts shall be such, in character and weight, as to establish reduction to practice prior to the effective date of the reference * * *."

In the present instance, the Court clearly erred. If the Court was convinced as to the veracity of appellant as a witness in his testimony that he had made the invention in 1938 (App. pp. 28a-29a), no corroboration was required. Corroborating exhibits 16(a), (b), and (c), rather than being vague and indefinite, were cumulative.

Appellant having antedated the Ward patent, claim 11 was clearly improperly refused as involving no invention over that reference. The fact that appellant may or may not have owned at one time a partial interest in the Ward patent is irrelevant. The underlying feeling of the trial Court may have been that the claims in suit here should have been included in the Ward patent when it was co-pending with the parent application, No. 606,708. But patentees and inventors are not free to make such election under the statute. The statute, 35 U. S. C. 101, which authorizes the granting of a patent to "whoever" makes an invention or discovery or improvement thereon necessarily does not authorize the granting of a patent in the name of persons who did not, in fact, make the invention. By the same token, the statutory word, "whoever," includes and extends the benefit of the statute to any inventor, without regard to whether or not he may or may not have an interest in another patent.

Claims 3 and 4.

Claims 3 and 4 are the claims which point out appellant's discovery that an ordinary colored testing agent need not be oily to be operative in penetrant methods of flaw detection provided that the colored agent actually penetrates the flaws as a solution *and* that an *absorbent liquid* be subsequently used to develop the flaw indications. It is this critical proviso, which appellee has never been able to find in either the Swiss patent or the Switzer fluorescent patent, No. 2, 259,400, that explains why the disclosure of the Swiss patent is inoperative.

In the very reliance upon the Swiss patent in the light of the Switzer patent to refuse claims 3 and 4, there was, necessarily, tacit assumption by the Patent Office and the Court below that the disclosure of the Swiss patent would work or could be made to operate. But the testimony of the witness Joseph Switzer (App. pp. 12a-14a) and the exhibits clearly establish that the disclosure of the Swiss patent is inoperative and it is the sound rule of this Circuit that a foreign patent is good as a reference only for what it actually discloses. An inventor is not to be deprived of a United States patent if, to find a teaching of his invention, one must experiment with the disclosure of a foreign patent. *In re Ek,* 57 App. D. C. 203, 19 F. 2d 677; *Beckett v. Coe,* 69 App. D. C. 51, 98 F. 2d 332; *Switzer, et al. v. Marzall,* 96 F. 2d 332. See also *Carson v. American Smelting & Refining Co.* (CA 9), 4 F. 2d 463, 465.

Even assuming that the Swiss patent were prior art, the inoperativeness of it certainly would not suggest to one skilled in the art that the Switzer fluorescent process might be varied as to its essential components, namely, the fluorescent dye and fluorescigenous radiation employed, and the very phenomenon by which it operates. Rather, such inoperativeness of the Swiss patent would demonstrate to one having skill in the art that failure would result by departing from the essential characteristics of the Switzer fluorescent process. That appellant succeeded in developing a visible penetrant method of flaw detection before the skilled technicians of the Swiss patentee (I. G. Farbenindustries), failed, demonstrates that appellant was far and unexpectedly ahead of the art, not behind it.

Appellant concurs with the understanding of the Court that the Swiss patent, issued in 1943, is not anticipatory of claims 3 and 4 (App. p. 10a; Oral Ruling, App. p. 42a). But it was a factual fallacy for the Court to proceed from that correct premise to an assumption that the Swiss patent was *prior* art with respect to appellant. Since the Swiss patent is not anticipatory as a statutory bar, it cannot, under the facts of this case, demonstrate the state of the art chargeable to appellant. And this failure of the Swiss patent to serve as a demonstration of the state of the art does not involve the legal fiction that appellant is chargeable with knowledge of a patent granted in a country surrounded by an enemy at the time the patent was issued in 1943. Purely on the basis of dates of invention, the Swiss patent forms no part of the art chargeable to appellant.

Under 35 U. S. C. 103, obviousness or non-obviousness of a claimed invention is to be evaluated as "the subject matter as a whole would have been obvious, *at the time the invention was made,* to a person having ordinary skill in the art to which the subject matter pertains" (emphasis supplied). As shown by the appellant's accepted testimony and the exhibits, appellant conceived of the invention in suit as early as 1938. The Swiss patent was not even isued in Switzerland until 1943 or available in this country until 1946.

The refusal of claims 3 and 4 on the Swiss patent as evidence of the state of the art is manifestly a refusal based, not upon disclosure, but an inference drawn in the light of afterevents. This is no basis for denying patentability. *Skelly Oil Co. v. Universal Oil Products* (CA 3), 31 F. 2d 427, 431. Indeed, if any speculation as to the Swiss patent is to be permitted, it is that it is fortunate that appellant did not, in fact, know or could have known of the later Swiss disclosure at the time he made the invention in suit. Such knowledge of inoperativeness could have steered appellant away from his discovery of this process which has become a standard process for assuring safety and performance of equipment in vital industries.

CONCLUSION.

For the foregoing reasons, it is respectfully submitted that the judgment of the Court below should be reversed for inescapable errors in fact and law.

Respectfully submitted,

Albert L. Ely, Jr.,

Attorney for Appellant.

APPENDIX OF STATUTES AND RULES

Pursuant to Rule 17(c)(6).

Title 35, United States Code—Patents.

§ 101. Inventions patentable

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, *or any new and useful improvement thereof,* may obtain a patent therefor, subject to the conditions and requirements of this title. (R. S. 4886; 35 U. S. C., 1946 ed., 31.) (Emphasis supplied.)

§ 102. Conditions for patentability; novelty and loss of right to patent

A person shall be entitled to a patent unless—

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the *application* for patent in the United States, or

* * * * *

§ 103. Conditions for patentability; non-obvious subject matter

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

§ 120. Benefit of earlier filing date in the United States

An application for patent for an invention disclosed in the manner provided by the first paragraph of section 112 of this title in an application previously filed in the United States by the same inventor shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application.

Rules of Practice of the United States Patent Office.

131. Affidavit of prior invention to overcome cited patent or publication. (a) When any claim of an application is rejected on reference to a domestic patent which substantially shows or describes but does not claim the rejected invention, or on reference to a foreign patent or to a printed publication, and the applicant shall make oath to facts showing a completion of the invention in this country before the filing date of the application on which the domestic patent issued, or before the date of the foreign patent, or before the date of the printed publication, then the patent or publication cited shall not bar the grant of a patent to the applicant, unless the date of such patent or printed publication be more than one year prior to the date on which the application was filed in this country.

(b) The showing of facts shall be such, in character and weight, as to establish reduction to practice prior to the effective date of the reference, or conception of the invention prior to the effective date of the reference coupled with due diligence from said date to a subsequent reduction to practice or to the filing of the application. Original exhibits of drawings or records, or photocopies thereof, must accompany and form part of the affidavit or their absence satisfactorily explained.

BRIEF FOR APPELLEE AND APPENDIX

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

United States Court of Appeals
For the
District of Columbia Circuit

FILED SEP 30 1957

Joseph W. Stewart
CLERK

APPEAL NO. 13,948

ROBERT C. SWITZER, APPELLANT

v.

ROBERT C. WATSON, COMMISSIONER OF PATENTS,
APPELLEE

APPEAL FROM THE JUDGMENT OF THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA

CLARENCE W. MOORE,
Solicitor, United States Patent Office,
Attorney for Appellee.

J. SCHIMMEL,
Of Counsel.

STATEMENT OF QUESTIONS PRESENTED

In the opinion of appellee the questions presented are:

1. Whether, where the subject matter of one of the claims at issue is essentially the same as that adjudicated as unpatentable in a joint application of appellant and another by the Court of Customs and Patent Appeals, because of double patenting, that decision is not conclusive against appellant under the doctrine of res adjudicata.

2. Whether, where the trial Court holds that the decision of the Court of Customs and Patent Appeals in appellant's joint application is persuasive and will be followed on the issue of noninvention and nonpatentability over the prior art, the same single inventive concept being involved, the findings as to noninvention and nonpatentability after consideration of new evidence, are so clearly erroneous as to justify or warrant independent review by the Court, in view of Rule 52 (a) of the Federal Rules of Civil Procedure.

3. Whether the trial Court's ruling that one seeking to antedate a patent which is part of the prior art must establish the earlier date with certainty and the evidence presented must be corroborated (Conclusion of Law No. 3, Appellant's App. 46a) is so erroneous, as a matter of law, as to require intervention by this Court.

4. Whether, the trial Court erred in finding that the nondestructive testing method defined in claims 3 and 4 did not define invention over appellant's own

prior patent, where the step that appellant took in his present application was to use a solution of an ordinary dye for a luminescent dye as the testing agent, and to use visible light for inspection instead of radiant energy, and the evidence shows that the concept of using organic dyes and visible light for the same purpose was suggested in a prior Swiss patent.

5. Whether the trial Court erred in holding that, since the Ward patent is in part owned by the appellant, a forbidden instance of double patenting would be represented by the allowance of claim 11 at issue.

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United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

APPEAL NO. 13,948

ROBERT C. SWITZER, APPELLANT
v.
ROBERT C. WATSON, COMMISSIONER OF PATENTS,
APPELLEE

APPEAL FROM THE JUDGMENT OF THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA

BRIEF FOR THE COMMISSIONER OF PATENTS

INTRODUCTION

This is an appeal from the judgment (Appellant's App. 47a) of the United States District Court for the District of Columbia, dated March 12, 1957, dismissing appellant's complaint (Appellant's App. 1a) against the appellee, Commissioner of Patents, in an action brought under Section 145 of Title 35 of the United States Code, in which appellant sought a decree authorizing the Commissioner to grant Letters Patent of the United States to plaintiff (appellant), based upon and containing certain claims of appellant's patent application Serial No. 85,749, filed April 6, 1949, entitled "Flaw Detection." The complaint was dismissed by the trial Court as to the three claims involved on merits (Finding of Fact No. 5, Appellant's App. 45a) for the reason that the claims sought define subject matter which is noninventive and nonpatentable over the disclosures of certain prior patents, and that in addition, insofar as claim 11 is concerned, it is unpatentable on the ground of double patenting. (Findings of Fact Nos. 12–17, Appellant's App. 46a). Notice of appeal from the final judgment of the District Court was filed April 11, 1957 (Appellant's App. 47a).

While appellant's appendix includes the oral ruling of the Trial Court, and the findings of fact and conclusions of law separately made by the Court (Appellant's App. 41a–46a), it does not contain the application in Suit, the prior patents, or the decisions of the Patent Office tribunals expressly referred to in the Court's opinion. Although this Court by Rule 17 (d) specifically provides that appellant shall furnish appellee with a statement of the parts of the record he proposes to print in the appendix to his brief within 10 days after the filing of the record on appeal, and by Clerk's note has placed the bar on notice that a single joint appendix is preferred (p. 11 of the General Rules of this Court), counsel for appellant did not comply with this rule. Counsel for appellee was unaware of the fact that the material mentioned above was not to be printed by appellant until receipt of a copy of appellant's brief and appendix on Sept. 6, 1957. The record in this case was filed on June 17, 1957. Inasmuch as this is not the first time that counsel has flouted the express mandate of Rule 17 (cf. Appeal No. 13,395, *Switzer* v. *Watson*), it would seem that this discourtesy to counsel for appellee and to the Court is censurable.

In any event, since it is believed that the facts material and essential to the basic primary question presented by the appeal should not and cannot be decided without reference to the decisions of the Patent Office tribunals and the prior patents upon which those decisions were based, as well as the decision of the trial Court, these documents, which are part of the record on appeal, will be included as an appendix to this brief in accordance with Rule 17 (e) (7).

APPELLANT'S APPLICATION

Appellant's Application, though made of record on appeal, has not been reproduced in appellant's appendix. Appellant's statement of the case (Br. 2-5) contains only a meager reference to what the specification of the application at bar points out in overcoming certain shortcomings of the process of appellant's prior patent (Br. 5). It might be helpful to the Court to have a concise statement at this point of the specification disclosure as a background against which to consider the claims at issue.

The application states that the invention relates to methods and agents for locating surface flaws in tests bodies. It acknowledges that a prior patent of appellant's (No. 2,259,400) discloses methods of detecting such flaws using a luminescent testing agent and inspecting the surface of the body in darkness using fluorescigenous radia~~tive~~ion to indicate the flaw location (Appellee's App. 1b). The patented method is said to have been successfully used on small articles but that several problems have arisen in the production testing by that method which are overcome by the invention of this application, particularly as to larger and heavy articles (Appellee's App. 1b). The method of testing according to this disclosure comprises the steps of (1) heating the test body; (2) cooling the heated body while the surface to be tested is covered with a testing agent having visible color and preferably water-emulsifiable; (3) removing excess testing agent as by flushing with water; (4) causing the testing agent retained in the flows to exude to the surface, as by heating and/or applying an absorbent for the testing agent; and (5) inspecting under daylight conditions, the location of flaws, if any, being revealed by color contrast (Appellee's App. 3b). Specific example of each of these five steps are given in the more detailed description. In one technique the testing agent is a solution of a dyestuff in a penetrating mineral oil (Appellee's App. 8b), or high boiling alcohols (Appellee's App. 9b); or even heat-sensitive salts (Appellee's App. 9b). The preferred technique uses a testing agent comprising a penetrant oil, and oil-soluble coloring material and an emulsifying agent which renders the testing agent water-emulsifiable (Appellee's App. 11b).

THE CLAIMS

The claims at issue are those numbered 3, 4, and 11 in the complaint (Appellant's App. 1a). Appellant compares these claims with a claim which the Patent Office has allowed to appellant (Br. 2, 3), and that comparison appears to be essentially a correct one. It is evident from this comparison that the claims at issue are broader than the allowed claims; claim 8 being broader in both the definition of the testing agent solution, and the absorbent solution, while claim 11 omits the final step of the allowed claim altogether.

THE PRIOR ART

The prior patents relied upon by appellee below are:

Switzer, 2,259,400, Oct. 14, 1941 (Appellee's App. 36b).

Ward, 2,405,078, July 30, 1946 (Appellee's App. 53b).

I. G. Farben (Swiss), 224,242, Feb. 1, 1943 (Appellee's App. 71b).

The Switzer patent is appellant's patent acknowledged in the specification of the application at bar (Appellee's App. 1b). It describes a rapid and nondestructive test for locating flaws in metallic articles by applying to the cleaned article a solution which may be "hot penetrating oil saturated with dyestuffs," removing excess testing solution, permitting the solution to "bleed" or seep from the flaws, and then treating with a second agent which fixes, absorbs or is dyed by the first agent remaining about the flaw (Appellee's App. 38b, ~~p. 1, col. 2, line 32 to p. 2, col. 1, line 20).~~ The treating agent and the inspection conditions are correlated to give maximum contrast between the surface of the article being tested and the agent retained in and about the flaws ~~(p. 2, col. 2, lines 34-66~~).

The patent to Ward relates to an improvement in the method of Switzer patent No. 2,259,400. The testing agent is said to be luminescent and preferably water-emulsifiable (Appellee's App. 56b, ~~col. 3, lines 3-28~~). Inspection is under suitable lighting conditions as described in the Switzer patent.

The Swiss patent likewise relates to a nondestructive testing method, and the basic concept is to make apparent shrinkage holes by causing blisters of colored substances to appear on the surface as an index of the defective places. The blisters are caused by treating the articles in solutions of colored substances, aqueous or alcoholic solutions being mentioned, rinsing off excess solution and drying, whereafter the dye solution exudes from the places where flaws exist, so as to be clearly visible (Appellee's App. 72b). In addition, it is disclosed that chromate containing solutions in high boiling alcohols can be used, particularly with magnesium alloys, for after drying such an article after treatment with the chromate, the yellow color of the chromate exuding from the flaws is clearly distinguishable on the white or gray of the magnesium article.

SUMMARY OF ARGUMENT

1. The application at bar filed by appellant as sole inventor contains a description of the alleged invention which is identical with that which had been previously presented in application Ser. No. 606,708 to the Patent Office as a joint invention of appellant and one, Richard A. Ward. In the joint application the Court of Customs and Patent Appeals had denied

claims to subject matter which is essentially the same as that defined in claim 11 at issue here. Under these circumstances, the matter of the patentability of claim 11 should be res adjudicata.

2. Claim 11 defines nothing inventive or patentable over Ward patent 2,405,078 having an effective filing date of April 18, 1944. Appellant's effective filing date is asserted to be that of joint application Ser. No. 606,708, i. e., July 23, 1945. The patent is prima facie anticipatory under Section 102 (e) of Title 35 U. S. C.

Appellant's attempt to antedate the reference was an abortive one. Oral testimony of appellant was presented to overcome the reference, together with meager documentary exhibits. The documentary exhibits are vague, indefinite and ambiguous with respect to the subject matter of claim 11. There was a total absence of corroboration of the essential and vital element of reduction to practice. Only appellant's bald, self-serving statement that he reduced the invention of the claim to practice in 1938 appears in the record. Manifestly, this is insufficient and inadequate; it does not and cannot carry thorough conviction sufficient to permit appellant to monopolize subject matter which will be in the public domain at the expiration of the Ward patent. Hence, Ward is not removed as a reference.

While Ward describes his testing agent as a luminescent material, he states that they are dyes and that they may be dissolved in a penetrating oil. Claim 11 is broad enough to include these testing agents, since it calls only for an oily solution of colored substances. The sole distinction between

Ward and claim 11 appears to lie in the conditions of testing, the claim calling for "visible light." However, the use of visible light for nondestructive testing is old in the Swiss patent 224,242, which is available as prior art, even if the alleged inoperability of the disclosed method as a whole is accepted as proved. One skilled in the art given the disclosures of Ward and the Swiss patent would have little or no difficulty in utilizing the concept of the Swiss patent in Ward and in making that concept operative.

3. In addition claim 11 defines subject matter not patentably distinguishable from the claims of the Ward patent which on its face is owned by appellant and his brother. This same question was at issue before the Court of Customs and Patent Appeals in appellant's joint application, Ser. No. 606,708, where the matter of part ownership was held to be immaterial in cases involving a single inventive concept. The law of that case is clearly applicable to this case, since there is no patentable distinction between the subject matter adjudicated by the Court of Customs and Patent Appeals and claim 11.

4. Claims 3 and 4 define nothing inventive over Switzer patent 2,259,400 and the Swiss patent. Actually these claims are broad enough to read on Switzer alone, since there is no express or even implied limitation to the use of visible light only for inspection. Claims 3 and 4 would bar anyone from operating under the teachings of this patent. Clearly, appellant is not entitled to claims at this late date which would withdraw from the public disclosures which would

normally be available to it in 1958, the expiration date of the Switzer patent.

Furthermore, if these claims are to be interpreted to be limited to the use of visible light during inspection, that broad concept is old in the Swiss patent, and there would be nothing unobvious in utilizing that concept, when operating the Switzer process. Moreover, the claims are so broad as to read upon the alleged inoperative compositions of the Swiss patent. The finding of the trial Court as to claims 3 and 4 is a reasonable one on the record.

THE ARGUMENT

Inasmuch as appellant has chosen to present his case as to claim 11 first (Br. 10) the same order will be followed here.

Appellee before the Trial Court urged that claim 11 was not patentable to appellant in the application at bar (1) because of the Ward patent and (2) because of the doctrine of res adjudicata, based upon a prior decision of the Court of Customs and Patent Appeals involving a joint application of appellant and Ward. *In re Ward et al.*, 43 C. C. P. A. 1007, 236 F. (2d) 428. The Trial Court decided the issue as to the Ward patent "irrespective of any question of res judicata," although the Court stated that the discussion of that Court as to certain issues, which were common to that case and the present proceeding, was considered "very persuasive and will be followed as an authority" (Appellant's App. 42a). Under these circumstances it is believed that appellee may urge here the matter of res adjudicata in support of that portion of the judgment appealed from as pertains to claim 11, on the authority of *U. S.* v. *American Railway Express*, 265 U. S. 425.

1. Res adjudicata

As clearly appears from the reported decision of the Court of Customs and Patent Appeals referred to above, that appeal involved ~~in~~ an application in the name of *Ward et al.*, identified as Serial No. 606,708. The transcript of the record before that Court was placed in evidence as defendant's (appellee's) Exhibit G, and that transcript is part of the record before this Court. On its face the transcript shows that application Ser. No. 606,708 was filed by appellant and Richard A. Ward as joint inventors (Appellee's App. 76b). In addition appellant's brief (Br. 11) states that the application at bar is a continuation of that joint application, and that under Section 120 of Title 35 U. S. C. the present application in the name of Robert C. Switzer alone is entitled to an effective filing date back to the date of that application. Further, it should be noted that appellant here, on cross-examination, stated that in the application at bar filed in his name as sole inventor "the specification was copied practically verbatim from the joint *Switzer* and *Ward* case" (Appellant's App. 39a). The brief confirms that statement (Br. 11).

The transcript of record in the case before the Court of Customs and Patent Appeals shows that both method and composition claims were at issue there (Appellee's App. 78b). That Court considered claim 1 illustrative of the method at issue, and it is quoted in the decision. A comparison of that claim with claim 11 sought here shows that each claim defines the same identical steps for the same purpose. The sole difference is that in adjudicated claim 1 the testing agent is defined as "water emulsifiable * * * having a color contrasting with the surface of the test body," whereas in claim 11 it is defined as "an oily liquid capable of wetting the surface of the test body and a dye dissolved in said liquid." Inasmuch as these claims are based upon identical disclosures it is evident that they differ in scope only. Moreover, reference to the transcript before the Court of Customs and Patent Appeals shows also that claim 8 defined the testing agent as "oily"; that claim 9 specified broadly "a colored liquid testing agent"; and that claim 16 defined a testing agent comprised of "water-insoluble oils" and "an oil-soluble colored dye dissolved" therein (Appellee's App. 79b). These claims show clearly that the same issues were present in that case as are presented here by claim 11. A court of competent jurisdiction having finally adjudicated that such subject matter is not allowable to appellant and Ward as joint inventors in a separate application, it is submitted that that adjudication should be conclusive against appellant under the doctrine of res adjudicata.

It is no longer open to question in this Court that the basic doctrine of res adjudicata is applicable to decisions of the Patent Office and of the courts in patent matters. *Daniels* v. *Coe,* 73 App. D. C. 54, 116 F. (2d) 941; *Hemphill* v. *Coe,* 74 App. D. C.

123, 121 F. (2d) 897; *Taylor et al v. Marzall*, 90 U. S. App. D. C. 350, 196 F. (2d) 592; *Weeks et al. v. Warp et al.*, 95 U. S. App. D. C. 235, 221 F. (2d) 108. In the *Hemphill* case this Court said:

> * * * an appeal from a decision of the Patent Office * * * to the Court of Customs and Patent Appeals precludes later maintenance of a bill in equity upon the same application. The remedies are alternative and mutually exclusive * * * The remedy elected is conclusive of the issues raised and of those which might have been raised. A party therefore by filing a second application cannot obtain a review of questions which were or might have been determined on a review relating to the first.

These cases established that the final decision of the Court is conclusive and that a party cannot re-litigate the same question by the filing of a second application and asserting claims to the same subject matter in that case. It should be noted also that that rule applies whether the decision in the prior case was right or wrong or was induced by the want of the particular evidence offered in the second proceeding. *Blackford* v. *Wilder*, 28 App. D. C. 535.

Accordingly, under this settled doctrine, it is crystal clear that the decision of the Court of Customs and Patent Appeals established as an ultimate and conclusive fact that the subject matter embraced by the claims of the Switzer and Ward application Ser. No. 606,708 was unpatentable to appellant in that joint application.

Appellant's sole application in suit here makes no disclosure additional to or different from that of appellant's adjudicated joint application. The prior adjudication of the same subject matter from the standpoint of patentability should foreclose this applicant from urging the question of patentability of claims to that subject matter in this proceeding. *Weeks et al.* v. *Warp et al., supra.* In this connection it is pointed out that when appellant joined with Ward in the filing of the joint application he made the conventional oath therein, joining in asserting that they were joint inventors of the subject matter "described and claimed" in that application. In the application at bar, in which the specification is "practically a verbatim copy" of the joint application, appellant made the same conventional oath except that he averred now that he was the sole inventor of that same identical subject matter. Under these circumstances, should appellant be permitted to ask this Court to review the decision of the District Court holding that claim 11 is unpatentable?

2. The Ward patent (re claim 11)

Finding of Fact No. 15 (Appellant's App. 46a) states that claim 11 defines nothing inventive over the Ward patent, bearing in mind all items of the prior art. The facts of record upon which that finding is grounded are as follows:

Appellant's application at bar filed on April 6, 1949, asserting the benefit of the filing date of Switzer and Ward application Ser. No. 606,708, filed July 23, 1945 (Br. 11) describes a five step method of testing nondestructively for surface discontinuities (Appellee's App. 3b). On July 30, 1946, Richard A. Ward obtained Patent No. 2,405,078 based on an application filed April 18, 1944; this patent was issued to Robert C. Switzer and Joseph L. Switzer (Appellee's App. 53b). That patent discloses the same five step method, as is clearly evident from a casual visual comparison of the substantially identical language of the patent (Appellee's App. 36b ~~col. 2, lines 2-28~~) with that of the application at bar, the sole difference being that Ward describes the testing agent as being luminescent, and the use of lighting conditions for inspection correlated with the testing agent. Under Section 102 (e) of Title 35 United States Code the patent is prima facie anticipatory. Appellant does not dispute that this subject matter is disclosed in Ward.

Appellant contends (Br. 11) that the Ward patent is not an available reference with respect to the application in suit, because he made the claimed invention before the filing date of the Ward patent, relying apparently on the oral testimony of appellant to support that contention (Br. 12). The trial Court held (Finding of Fact No. 11, Appellant's App. 46a) that date of conception of an invention cannot be established by the uncorroborated oral testimony of the inventor, considering the documents presented in corroboration of that testimony, over objection by counsel for appellee (Appellant's App. 30a), as too vague and indefinite. Appellant challenges that ruling here asserting that no corroboration is required (Br. 13) and that appellant's bald statement that he reduced the invention in suit to practice in 1938 is sufficient to remove the Ward patent as a reference (Br. 12) and that under Rule 131 of the Patent Office only a showing of facts is necessary to antedate a reference (Br. 12). Presumably it is urged that no more should be required here.

With respect to appellant's first contention, it is submitted that the law is well established that a party seeking to carry the date of invention back of the date of an anticipating patent assumes the burden of proof, and must establish the earlier date with certainty. *Deering* v. *Harvester Works,* 155 U. S. 286; *Moline Plow Co.* v. *Rock Island Plow Co.* (C. C. A. 7), 212 F. 727; *Barber* v. *Otis Motor Sales Co.* (C. C. A. 2), 271 F. 171; *Oliver Machinery Co.* v. *Gellman* (C. C. A. 6) 104 F. (2d) 11; *Thompson* v. *Amer. Tobacco Co.* (C. C. A. 4) 174 F. (2d) 773. Furthermore, an invention is the result of an inventive act; it consists in conceiving an idea and reducing it to practice. *U. S.* v. *Dubilier Condenser Corp.,* 289 U. S. 178. Conception of an invention is the formulation in the mind of the inventor of a definite idea of the complete and operative thing as it is thereafter to be applied in practice. *Mergenthaler* v. *Scudder,* 11 App. D. C. 264; *Townsend* v. *Smith,* 17 C. C. P. A. 647, 36 F. (2d) 292; and both conception and reduction to practice must be clearly established by proof. *Townsend* v. *Smith, supra.*

In addition, the law requires independent corroboration of all the essential factors concerned in reduction to practice. In *Miessner Inventions, Inc.* v. *Hoschke et al.,* 76 App. D. C. 343, 131 F. (2d) 865, this Court stated that "it requires more than the inventor's testimony to show reduction to practice. It is fundamental that his testimony, however clear, must be corroborated upon this point." And in *Collins* v. *Olsen,* 26 C. C. P. A. 1017, 102 F. (2d) 828 the Court of Customs and Patent Appeals said:

> We must conclude that statements in reports by Olsen, no matter how clear, as to what he used, what he did and what the results were, cannot be accepted as proof of reduction to practice, unless fully corroborated, * * *. While they constitute good evidence to conception, they are self-preserving on the question of reduction to practice.

Corroboration of the inventor's testimony of reduction to practice in order to eliminate an anticipating patent was required also in *Cothran* v. *Coe,* 38 F. S. 984; *Schering Corp.* v. *Marzall,* 101 F. S. 571, and in *Larsen* v. *Marzall,* 90 U. S. App. D. C. 260, 195 F. (2d) 200.

The Trial Court's finding that appellant's evidence submitted to show that he antedated the Ward patent was insufficient, the documentary exhibits being too vague and indefinite, and the testimony of appellant being uncorroborated, (Finding of Fact No. 11, Appellant's App. 46a), may not be set aside unless it is an unreasonable one or clearly erroneous. *Standard Oil Development Co.* v. *Marzall,* 86 U. S. App. D. C. 210, 181 F. (2d) 280; *Besser* v. *Ooms,* 81 U. S. App. D. C. 7, 154 F. (2d) 17. Appellant points to no evidence, other than his own oral testimony. This self-serving testimony can hardly be said to be proof. To deprive the public of its rights to the Ward disclosure on such meager proof would be contra to the decisional law, cited above. Under the circumstances of this case, it is submitted that the Trial Court's finding was correct and that under Rule 52 (a) of the Federal Rules of Civil Procedure Finding of Fact No. 11 merits this Court's approval.

Insofar as appellant relies upon Rule 131 of the Rules of Practice in Patent Cases it suffices to say at this point that the Board of Appeals in its decision in this case (Appellee's App. 24b) held that Rule 131 could not be relied upon, for reasons which were more fully stated in their decision in appellant's joint application Ser. No. 606,708, previously referred. The Court of Customs and Patent Appeals affirmed the Board's ruling that Rule 131 was inapplicable, and therefore, it would appear that the holding of the court in that case (34 C. C. P. A. 387 at 392) on this identical question is and should be the law of this case.

Since the Ward patent has not been antedated it is available to negative novelty and invention in the subject matter of claim 11. One difference between Ward and the claim at issue is that Ward describes the use of a luminescent testing agent, whereas the claim here calls for the use of a testing agent having an oily vehicle and a dye dissolved therein. However, Ward' luminescent agent may be a dye and the vehicle therefor may be a penetrating oil (Appellee's App. 60b ~~col. 5, lines 21 and 45~~). Clearly the claim at bar is broad enough to cover the testing agents disclosed in Ward; therefore there is nothing novel in using oily solutions of colored substances as testing agents. Ward anticipates this concept. The sole distinction between Ward and claim 11, if any, lies in the conditions specified for inspecting the piece being tested, the claim calling for "visible light." Ward states that the test body is inspected under suitable lighting conditions as described in Switzer patent No. 2,259,400 (Appellee's App. 55b). Switzer patent states that normally inspection is under viewing conditions so designed and controlled in each specific case as to obtain maximum contrast (Appellee's App. 41b, ~~p. 2, lines 33-40~~), while this patent does state that under certain conditions visible light should be excluded it is to be noted also that mono-chromatic light obtained with common light sources and filters (~~p. 2, col. 2, lines 45-55~~). In any event the use of visible light for flaw detection by color contrast is old in the art, as evidenced by the Swiss patent (Appellant's App. 71b). While appellant contends that it is a fallacy to consider the Swiss patent part of the prior art with respect to appellant, presumably because it is not anticipatory (Br. 15), although before the Trial Court appellant contended that it was not a reference because war conditions made it unavailable in this country (Appellant's App. 43a), it is noted that an inventor is chargeable, under the law, with knowledge of everything that preceded him even though he may in fact have been ignorant of the prior art. *Rosaire* v. *Baroid Sales,* 101 U. S. Patents Quarterly 366. Obviously, since appellant has not antedated this patent, it is available to show that the only possible distinction over Ward is not novel. Given the disclosure of the Swiss patent, it is submitted that the adaptability of visible light for inspection purposes would be obvious to one skilled in the art; hence claim 11 would be unpatentable in view of Section 103 of Title 35 U. S. C.

Appellant also contends that the Swiss patent cannot be relied upon because the testimony of Joseph Switzer, appellant's brother, established that the disclosure of the Swiss patent is inoperative (Br. 14). The Trial Court held that it is immaterial, since it was used only to show that the additional step taken by appellant was old and did not involve the exercise of the inventive faculty (Appellant's App. 42a). However, the law is clear that even though a reference is inoperative as a whole, that does not mean that each and every portion thereof is worthless as a disclosure or teaching to those skilled in the art. *Pickering* v. *McCullough,* 104 U. S. 310; *Gilbert et al.* v. *Marzall,* 87 U. S. App. D. C. 1, 182 F. (2d) 389; *Bullard* v. *Coe,* 79 App. D. C. 369, 147 F. (2d) 568. And even should the demonstration of inoperability be conclusive it is still necessary to show invention. *Sloane* v. *Coe,* 74 App. D. C. 200, 122 F. (2d) 37.

Hence, it is submitted that Finding of Fact No. 15 (Appellant's App. 46a) has ample support in the record, that it is a reasonable one, and that under Rule 52 (a) of the Federal Rules of Civil Procedure it should be affirmed.

3. Double patenting

The Trial Court found that claim 11 defines subject matter which represents double patenting in view of the Ward patent (Finding of Fact No. 16, Appellant's App. 46a). This finding is based upon a finding of no patentable distinction in the claims over the patent claims and upon common ownership of appellant's application and the Ward patent. That patent on its face shows at the time of its issuance it was owned by Robert C. Switzer and Joseph L. Switzer (Appellee's App. 53b). Appellant's testimony at trial was to the effect that the Ward patent is owned by Switzer Brothers, Inc. (Appellant's App. 35a), that he owns 50 percent of the stock of that corporation, and that he has the entire interest in the application at bar (Appellant's App. 36a). This part ownership in the Ward patent was considered by the Trial Court to represent a forbidden instance of double patenting (Appellant's App. 43a).

This same question of whether part ownership was sufficient to bring into play the established rule against double patenting was before the Court of Customs and Patent Appeals in Serial No. 606,708, involving appellant's joint application, where "the ownership of the Ward patent rests in R. C. Switzer and J. L. Switzer as joint tenants * * *, while ownership of the * * * application is in the same parties but as tenants in common, with R. C. Switzer holding a three-quarter interest and J. L. Switzer holding a one-quarter interest." This difference in ownership was held to be of no materiality in that case (34 C. C. P. A. 387 at 391) and it is submitted it is of no significance here.

It was pointed out above in the discussion of the application of the doctrine of res adjudicata how the claims before the Court of Customs and Patent Appeals in appellant's joint application (*In re Ward et al.*, 34 C. C. P. A. 387) were for the same subject matter as that of claim 11 at issue here. That Court found that "the appealed claims and the claims of the Ward patent are directed to a single inventive concept which is independent of whether the material which renders the testing agent effective is a luminescent substance or a daylight visible dye." Hence, the claim at issue here must of necessity be for the same inventive concept as the claims of the Ward patent.

The basic rule that an application cannot have two patents for the same invention, or only a colorable variation of it, has long been ingrained in the law of patents. The reason for the rule is said to be that the power to create a monopoly is exhausted by the grant of the first patent, and the government, having once conferred upon the inventor all it had to bestow in reference to that invention by the first patent, cannot add to the patentee's exclusive privilege by a repetition of the granting act. In applying that basic principle the Courts have held consistently that to support a second patent the claims thereof must show an inventive advance over the claims granted in the first patent. *In re Thompson,* 20 C. C. P. A. 725, 62 F. (2d) 90; *Weatherhead Co. et al.* v. *Drillmaster Supply Co. et al.* (C. C. A. 7), 227 F. (2d) 98; *Kistler* v. *Coe,* 79 App. D. C. 36. Further, the same rule has been applied to applications of different inventors having the same or a common assignee. *In re Willoughby,* 24 C. C. P. A. 1033, 88 F. (2d) 482; *In re Dunbar,* 51 App. D. C. 251, 278 F. 334.

Appellant contends here (Br. 11) as it was contended before the Court of Customs and Patent Appeals that the claims of the Ward patent and the claim in suit are mutually exclusive; they do not "cross-read." Without "cross-reading," it is argued, there can be no double patenting, citing *In re Stanley.* These contentions were rejected completely by the Court of Customs and Patent Appeals. The suggestion that "cross-reading" was indispensable to a holding of double patenting was considered again by that Court in a recent decision—*In re Ockert*—reported at 114 United States Patents Quarterly 330, and again rejected. Clearly, under these circumstances appellant's contentions deserve little or no consideration.

In concluding this aspect of the case appellee desires to call to the Court's attention the comment of the Court of Customs and Patent Appeals in the joint application case, that:

> Manifestly, that single concept could not have been originated both by Ward as a sole inventor and by the appellants, Ward and Switzer, as joint inventors.

To that comment appellee appends the following: that single concept which was first attributed to Ward, then claimed to be that of Switzer and Ward, now is being claimed by Switzer alone. Manifestly, something is fatally wrong with that presentation.

4. Switzer patent and Swiss patent (re claims 3 and 4)

The Trial Court found that claims 3 and 4 are unpatentable, because they do not define invention over Switzer patent 2,259,400 and Swiss patent No. 224,242 (Findings of Fact Nos. 13, 14, Appellant's

App. 46a). Appellant contends that these patents fail to disclose his discovery that an ordinary colored testing agent need not be oily to be operative provided that the colored agent actually penetrates the flaws as a solution and that ~~one~~ an absorbent liquid be subsequently used to develop the flaw indications (Br. 13). Further, appellant asserts that this alleged critical proviso explains why the disclosure of the Swiss patent is inoperative (Br. 13, 14).

In the first place it should be noted that appellant's prior patent 2,259,400 (Appellee's App. 36b) discloses a testing method in which the article is treated with a colored agent (dyes) in oily or nonoily solution (cf. Ex. 4, ~~p. 4, col. 1, lines 45-67)~~; and then a secondary agent or coating may be applied to absorb or pull a portion of the primary agent from the flaws of the casting Appellee's App. 43b ~~(p. 3, col. 1, lines 44-[illegible]~~). In Example 5 ~~(p. 4, col. 2, lines 1-15)~~ the secondary coating solution is said to be a "developer" and to consist of "lithopone ground into an alcoholic solution of white shellac." Clearly then there is no essential difference between the old process and that defined in these claims, since there is no express statement therein that inspection is by "visible light" as is set forth in claim 11. One operating under the disclosure of the patent would unquestionably use a "coloring material" (dyes as disclosed in the patent), which is all that is called for in claim 3, and would also use a second coating solution (the shellac-lithopone solution of Ex. 5, of the patent for example) which has a color providing a contrasting background for the coloring matter of the first solution, as called for in claim 4. Lithopone, according to standard dictionaries is used as a white pigment, and appellant includes white within the scope of his term "color" (Appellee's App. 15b).

If these claims are to be considered as covering only the process in which only nonfluorescent dyes are used as testing agents and visible light is used for inspection, which is disclosed in appellant's application at bar, then it is submitted that, since that broad concept is old in the Swiss patent, there is nothing unobvious in utilizing that concept in the Switzer patented process. Whether the Swiss process is inoperative in the totality of its disclosure is immaterial, as pointed out by the Trial Court (Appellant's App. 42a). Moreover, it should be noted that there is no limitation in these claims which excludes the alleged inoperative compositions of the Swiss patent. Surely, appellant should not be permitted to avoid a prior disclosure on the ground of inoperability and yet assert a claim which is so broad as to read upon and cover the inoperative material. *In re Crosby,* 34 C. C. P. A. 701, 157 F. (2d) 198. Also even if the specific examples of the Swiss patent be inoperative, nevertheless that patent may be a reference if only the skill of the art is needed to make it operative. *In re Michalek,* 34 C. C. P. A. 1124, 162 F. (2d) 229; *Bullard* v. *Coe,* 79 App. D. C. 369. Certainly with the broad suggestion in the Swiss patent that "aqueous or alcoholic solutions of organic dyestuffs" may be used in a nondestructive testing method, little more than a trial procedure is necessary to find the proper solution for the purpose.

The Court's finding (Finding of Fact No. 13, Appellant's App. 46a) that claims 3 and 4 do not define invention in view of these prior patents is properly supported in the record. It merits this Court's approval.

CONCLUSION

It is respectfully submitted that, for the reasons detailed here, the conclusions reached by the Patent Office tribunal and the District Court that the claims at issue are unpatentable to appellant in the application at bar were proper and have a reasonable basis in the record; that under Rule 52 (a) of the Federal Rules of Civil Procedure these findings and conclusions are not clearly erroneous, and that under the settled doctrine of this Court they should not be set aside. Further, it is submitted that as to claim 11 the nonpatentability of the subject matter defined therein is res adjudicata. The decision appealed from should be affirmed.

Respectfully submitted.

CLARENCE W. MOORE,
Solicitor, United States Patent Office,
Attorney for Appellee.

J. SCHIMMEL,
of Counsel.
SEPTEMBER 1957.

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SPECIFICATION

This invention relates to improved methods and agents for locating surface discontinuities or flaws in test bodies. My United States Patent No. 2,259,400 discloses methods of detecting subsurface flaws in substantially solid bodies comprising the steps of applying to the surface of the test body a luminescent testing agent which will penetrate the surface openings of subsurface flaws, removing the portion of the luminescent testing agent remaining on the surface of the body by solvent cleaning or particle blasting, and then inspecting the surface of the body in darkness and under fluorescigenous radiation for the portion of the testing agent which had penetrated into the surface openings of the subsurface flaws and which reappears as a luminous indicator of the flaw location. This invention, more particularly relates to an improvement in my foregoing method and to improved testing agents.

My aforesaid method has been a particularly successful non-destructive testing method for locating surface discontinuities, in small articles, such as blowholes and the like in cast bodies, and fatigue cracks, grinding cracks and the like in finished bodies. An especial advantage of the aforesaid method is that the composition of the test bodies generally has no effect on the efficacy of the method. The method has been employed successfuly for locating surface discontinuities in nonmetallic bodies as well as in both magnetic and nonmagnetic metallic bodies.

Several problems have arisen in the production testing by my aforesaid method, particularly of large and heavy articles. First, very fine cracks are penetrated very slowly by the testing agents, and, after penetrating, the testing agent will reappear at or on the surface very slowly. Second, testing agents which will penetrate fine cracks will also have great surface wetting properties and are, consequently, difficult to remove from the surface of the bodies being tested so that false indications will not be obtained. Third, in order to remove such thorough penetrating agents without affecting or destroying the finished surface of the body, suitable solvents or the like may be employed, but such solvents are usually expensive and large quantities must often be employed. Fourth, many large castings and like bulky articles are not readily transported to locations which may be darkened as required for inspection by the aforesaid Switzer method; such heavy bodies are also handled with considerable difficulty during the inspection procedure once the location is satisfactorily darkened. Fifth, the sources of the required fluorescigenous radiations, almost exclusively high intensity mercury vapor arcs, are relatively expensive special equipment. Sixth, some operators required to inspect test bodies continuously under such sources complain of the undesirable effect of continued eyeball fluorescence. Seventh, in some applications the method is too sensitive; the result in such cases has been over-inspection and excessive rejection by inexperienced operators.

It is the object of this invention to overcome the foregoing problems. Specifically, it is an object of this invention to provide a method or procedure which will accelerate the penetration of the testing agent into the flaws, accelerate the removal of the testing agent from the surface of the body, speed the reappearance on the surface of the body of the testing agent retained in the flaws and eliminate the necessity for darkened inspection locations and complex sources of fluorescigenous radiations. It is another object of this invention to provide a suitable testing agent which will rapidly penetrate the openings of fine flaws but which may be rapidly and thoroughly removed from the surface of the test body by inexpensive agents without being removed from the flaws in the test body. These objects are accomplished by heating the test body, cooling the test body in a water-emulsifiable testing agent having intense visible color, washing the testing agent from the test body, reheating the test body and/or applying an absorbent for the testing agent to the surface of the cleaned test body. The test body is then inspected in daylight or under artificial visible lighting conditions normally maintained for inspection lines.

Admittedly, this improved method of testing does not have the ultimate sensitivity of the testing method disclosed in my aforesaid patent. By testing according to this invention, however, one may obtain under daylight inspection conditions very rapid results which satisfy most practical standards, particularly in the inspection of heavy or clumsy articles. Any additional steps required by this invention are generally more than offset by its suitability to rapid production testing of articles in which the finest flaws are not cause for rejection.

Other objects and advantages of this invention will be apparent from the following detailed specification and the claims.

In general, the method of testing according to this invention comprises five preferred steps which may be carried out in several different ways. The five preferred steps are: first, heating the test body; second, cooling the test body while at least the portion of the surface to be tested is covered with a flaw-penetrating testing agent having intense, visible color and which is also preferably, but not necessarily, water-emulsifiable; third, removing the portion of the testing agent remaining on the surface of the body, as by flushing the body with water when the preferred water-emulsifiable agent is used; fourth, driving or drawing on or to the surface of the body a portion of the testing agent retained in the flaws; and fifth, inspecting the test body under suitable visible lighting conditions which will reveal the location and extent of flaws by the contrast between the intensely colored stains and the body surfaces. Specific examples of each of the steps are given below, but it is to be understood that the following examples are given by way of illustration and are not to be considered as limitations.

The body to be tested is preferably cleaned prior to heating. If the test body is a machined and finished metal part, for example, the suitable temperature to which it is heated can usually range between 90° and 160° C. Several factors must be taken into account to determine the maximum temperature to which the test body is to be heated, such as, for example, the physical deformation and stresses caused by heating; the effect on the temper of the body of the heating and subsequent cooling; the baking or carbonization, on the surface and in the flaws of the body, of residual films of cutting oil and the like; the oxidation of the surface of the body; and the dissociation, volatilization, and flash point of the testing agent which may be applied to the heated body. The test body can usually be heated quickly by soaking it in a vat of boiling water, although superheated steam, ovens, infra-red radiation, induced electric currents, hot solvents which may remove surface films, or other equivalent means, may be employed where expedient. When the test body is very large or unwieldly, localied areas, rather than the whole body, may be heated. If the body is heated with a liquid, it is often preferable to dry the body by superheated steam, hot air, or simply allowing the heat of the body to vaporize the liquid after removing the body from the heating liquid and before applying the testing agent.

The test body is then allowed to cool while the portion of the surface to be tested is covered with the testing agent. This is usually accomplished by simply immersing the heated test body in a bath of the testing agent maintained at approximately room temperature. While being cooled in the bath of the testing agent, the testing agent quickly penetrates the surface openings of the flaws. By the time the test body has been cooled to approximately room temperature, the testing agent will usually have penetrated all detectable flaws, although the time the test body is allowed to remain in the bath of the testing agent may depend upon the penetrating ability of the testing agent and the degree of fineness of the flaws desired to be revealed. As pointed out above, a preferred testing agent is a water-emulsifiable liquid having intense visible color and capable of penetrating the flaws to be revealed. Specific examples of suitable emulsifiable testing agents are given below.

After the test body has been immersed in the testing agent, the body is removed from the bath and excess testing agent is allowed to drain off. The testing agent remaining on the surface of the body is then washed off with wash water. To wash off the testing agent, the body may be simply sloshed in a vat or subjected to streams or sprays of wash water. If streams or sprays are employed, it is preferable that they should be no more forceful than necessary to wash the testing agent off the surface of the test body. The washed test body is then drained of wash water and may be dried by streams of warm air to evaporate wash water. Other procedures may be employed to remove excess wash water, such as by wiping the test bodies with absorbent cloths or by preferentially wetting the surface with another liquid according to the disclosure of the copending application of Taber de Forest for Wet Developer, Serial No. 563,798, filed November 16, 1944.

The cleaning methods employed in each case will depend largely upon the composition of the product as well as the finish desired. Rough castings may be readily cleaned by impact with shot in the orthodox shot-blasting machines which utilize air or centrifugal force to throw a continuous stream of shot; other products may be cleaned by abrasion with sand-blasting equipment or tumbling mills; and still other products may require solvent cleaning, air cleaning, wiping, brushing, etc. If the composition of the product is such that it will be corroded or otherwise injured by the use of water to clean the article, or if the article is cleaned by removing the surface upon which the applied testing agent remains, then it is frequently desirable to employ the non-self-emulsifying testing agents as described in the section under the heading "Nonemulsification Techniques" rather than the self-emulsifying testing agents as described in the section under the heading "Emulsifying Techniques."

After the testing agent has been washed or otherwise removed from the surface of the test body, a portion of the testing agent which penetrated the surface openings of the subsurface flaws in the body is forced or drawn to or on the surface of the body. In many instances sufficiently accurate results are obtained by either heating the body or by applying on the surface of the body a fine light-reflecting agent, termed a "developer," which apparently absorbs the testing agent by capillary attraction. Generally both an absorptive agent and heat are employed although in some instances an actual color-forming or color-contrast-enhancing chemical reaction may take place between the testing agent and the developer. A satisfactory light-reflecting absorptive agent is French talc, applied in either a dry, finely powdered state or as a thin suspension. Other satisfactory developers are disclosed in the above-identified application of Taber de Forest and, if the developer is one which preferentially wets the test body, the steps of removing wash water and developing may be conducted simultaneously. Developers in liquid form may be applied by immersion, brushing or spraying, whereas the application of powdered developers may entail blowing, dusting, tumbling, and the like.

Treated articles are normally inspected under a viewing condition so designed and controlled in each specific case as to cause maximum color contrast between the body surfaces and the particular extraneous substance used as a testing agent and retained in and about or seeping from the surface outlet of the flaws. If articles in one instance are treated with penetrating oils saturated with highly colored dyestuffs, subsequent inspection in daylight is usually preferable, although illumination from combination mercury arc and tungsten filament light sources as commonly used in inspection work, for example, will also serve. If test bodies are treated with agents chosen because of their distinctive and characteristic response to monochromatic light, such monocromatic light, carefully controlled as to intensity and direction of incidence, should be used to the exclusion of other light in the final inspection of the test bodies so treated, and it has been found that colored gelatine light filters in combination with common light sources will provide monochromatic light practically in some cases. Also, light-sensitive means other than the human eye, such as a photographic camera or a photoelectric cell, may be employed to respond to the contrast between the testing agent and the adjacent surface of the test body.

NONEMULSIFICATION TECHNIQUES

One simplified technique within the scope of this invention comprises treatment with solutions consisting of penetrating oils colored with oil-soluble dyestuffs. Mineral oils, diesel oils, transformer oils, commercial penetrating oils, kerosene, and the like may be used as vehicles for the dyestuffs. Satisfactory results may often be obtained by rapid dipping or simple coating, but complete immersion is usually recommended to insure penetration of minute tears, cracks, and other small cavities. Pressure tanks may be used and the pressure of the treating solution raised within practical limits by pumps to increase the penetration rate, depth of penetration, and amount of agent forced into the cavities.

Bodies so treated are next cleaned and subsequently inspected in daylight at any reasonable time following cleaning. The location of flaws is revealed by colored stains, for the highly colored oil seeps from the flaws to stain the surfaces immediately adjacent, sometimes leaving recrystallized dyestuff virtually "piled" around the surface openings of flaws. The "bleeding" or seeping of oil from flaws may be hastened if necessary by heating the cleaned articles or by striking them with sharp hammer blows, but oil stains of sufficient size generally result when cleaned articles are allowed to stand for a period of time before final inspection.

The dyestuff used in the above procedure should have excellent staining properties when in solution and should produce stains which contrast with and are readily detectable against the particular surface under inspection. It has been found that alpha-naphthalene-azo-alpha-naphthol solutions, for example, leave brown stains, benzene-azo-benzene-azo-beta-naphthol produces red stains, benzene-azo-resorcinol produced yellow stains, xylene-azo-beta-naphthol leaves orange stains, while o-toluene-azo-o-toluene-azo-beta-naphthol produces purple stains.

Many common dyestuffs, carried in such solvents as high boiling point alcohols, have also been used. In some instances, however, it has been found advantageous to first treat test bodies with such solutions, clean them, and then dip them in a secondary coating solution which drys on their surfaces, absorbs and "fixes" the dyestuff retained in and about the flaw openings, and which often forms a white or light-colored background upon which the colored lines and spots produced by the absorbed dyestuff are readily detectable in daylight. Pigmented white shellac paints, white water color paints, etc., serve very well as secondary coating materials.

Further, it has been found that heat-sensitive salts, carried into flaws and developed with heat may be useful in detecting flaws. Thus, the application of mild heat to metallic bodies treated with a solution of cobaltous chloride, for example, and subsequently cleaned, produces a distinctive blue stain in the proximity of flaw outlets. Inspection in this case will usually be carried out in daylight or in light from combination mercury-arc and incandescent sources.

Detection of flaws in test bodies through the use of a plurality of agents may be well exemplified by a procedure comprising, firstly, the application of a primary chemical solution in a manner similar to that described above, secondly, the removal of the agent from the external body surfaces, and, thirdly, treatment of the body with a secondary chemical solution which produces a colored reaction product in the proximity of the surface apertures of the flaws upon interaction with the primary agent retained in or seeping from the flaws. Thus, the reaction of a ferrous salt with potassium ferricyanide to form Prussian blue may be utilized in locating flaws, in which case the ferrous salt, as primary agent, may be carried into the flaws in a vehicle consisting of dextrine and glycerine. Development of the ferrous salt remaining in the locality of the flaws after subsequent cleaning is then accomplished by immersing the metallic body in a dilute solution of potassium ferricyanide. A blue reaction product results from this development, but if ammonium sulfo-cyanate is substituted for the potassium ferricyanide as developer, a brilliant red product is formed.

In like manner, a permanent brown stain may be produced about the surface apertures of flaws by first treating the test body with a solution of tannic or gallo-tannic acid in a carrier such as dextrine and glycerine, and after cleaning the body, dipping it into a developer solution containing ferrous sulfate. This procedure may be reversed, i. e., the ferrous sulfate may be carried into the flaws as primary agent, in which case the acid solution will serve as developer. Detection of the brown stains produced by such techniques is readily effected in daylight or artificial daylight.

EMULSIFICATION TECHNIQUE

The preferred testing agents of this invention, however, exhibit several essential characteristics, namely, intense color, excellent penetrating and surface wetting properties, and water-emulsifiability. The unique characteristic of the preferred testing agents is that of water-emulsifiability. It has been discovered that this characteristic allows the testing agent to be washed off the surface of the test body without being appreciably washed out of the flaw openings. The preferred characteristics are usually obtained by compounding the testing agent of a penetrant, a coloring material, preferably oil-soluble, and an emulsifying agent which renders the testing agent water-emulsifiable. The penetrant is preferably a water-insoluble oil or like liquid; it may be a single petroleum or hydrocarbon fraction or a number of them proportioned to give the penetrant good metal wetting characteristics, low surface tension, low volatility, suitable viscosity, and proper solvent power for the other constituents. The coloring material is an ingredient foreign, i. e., added, to the other ingredients of the testing agent; it is selected to provide the most distinctive contrast with the color of the surface of the particular body to be tested, giving due consideration to the effect of the developer which may be used. The emulsifying agent is usually composed of one or more oil-soluble soaps, detergents, or other surface-tension reducing agents which render the testing agent "self-emulsifying," that is, the testing agent will emulsify directly in water; in some instances it may be expedient to employ soaps or detergents which are not in themselves oil-soluble but which may be held in solution by a mutual solvent or coupling agent (often an alcohol) for the actual emulsifier and the oil; for the purposes of this invention, such mutual solvents or coupling agents may simply be considered a part of the emulsifying agent. It is not always essential to incorporate the emulsifying agent in the testing agent. Instead, the emulsifying agent may be incorporated in the wash water; in such instances, the testing agent may, for the purposes of this invention, be considered "emulsifiable" but not "self-emulsifying."

In formulating a specific testing agent, numerous variables must be considered. In selecting a specific penetrant to be employed, one should select a penetrant which will thoroughly wet the surface of the specific type of article to be tested. For example, penetrants which are excellent for metal may be less satisfactory for plastics and ceramics. The type of discontinuity likely to be found is also a factor in selecting a proper penetrant. If the flaws are likely to be blowholes, shrinkage cracks, or similar flaws having relatively large volumes and open surface openings such as may be found in cast metal articles, one may often use a penetrant which does not have the extremely thorough wetting properties and low viscosity necessary in a penetrant used for locating discontinuities having relatively closed surface openings such as grinding cracks, forging bursts, and the like. In selecting an emulsifying agent, one should avoid those which tend to form scums or sludges with the penetrant selected. The concentration of emulsifying agent is dependent not only upon the efficacy of the specific agent but also upon the type of discontinuity likely to be found. If the flaws are likely to be shallow, the testing agent should be removable from exterior body surfaces by a very gentle washing; if the flaws are likely to be deep and with relatively closed surface openings, the concentration of emulsifying agent may be decreased to permit complete emulsification to be obtained with the aid of sprays exerting a strong scrubbing action.

From the foregoing it is apparent that in the testing agents, the proportions of penetrant and emulsifying agent may vary widely. In any given case the proportions will depend upon the requirements of the articles to be tested and the properties of the specific ingredients, but in general the concentration of penetrant may vary upwardly from approximately fifty percent by weight, the concentration of emulsifying agent may vary up to approximately fifty percent by weight, and the concentration of coloring material may vary up to approximately ten percent by weight.

Illustrative but not limitative examples of suitable emulsifiable testing agents are as follows:

	Percent (by weight)
Example 1:	
1. Straight-run petroleum distillate, 300°F. fire point	83
2. Ortho-toluene-azo-ortho-toluene-azo-beta-naphthol	0. 3
3. Naphthenic acid soap (Molecular weight about 350)	16. 7
Example 2:	
1. Kerosene	77. 6
2. Benzene-azo-benzene-azo-beta-naphthol	0. 4
3. Octylaminoethanol soap of tetradecyl sulfuric acid	22
Example 3:	
1. Kerosene	54
"Texaco" penetrating oil	37
2. Tri (diethylene glycol ether) of sorbitol trioleate	2
3. Benzene-azo-resorcinol	7
Example 4:	
1. Kerosene	49
2. Xylene-azo-beta-naphthol	1
3. Sodium salt of mahogany acid	50
Example 5:	
1. Kerosene	53
2. Commercial Malachite Green	2
3. Sodium dodecyl benzenesulphonate	18
Cyclohexanol	27

In this example, the cyclohexanol serves as a mutual solvent for the penetrant, kerosene, and the emulsifying agent, sodium dodecyl benzene-sulphonate. The cyclohexanol may, therefore, be considered part of the emulsifying agent.

	Percent (by weight)
Example 6:	
1. "Texaco" penetrating oil	67. 3
Ethylene glycol monobutyl ether	16
2. Benzene-azo-benzene-azo-beta-naphthol	0. 7
3. Naphthenic acid soap	16

In this example ethylene glycol monobutyl ether serves to maintain the coloring material in solution in the penetrant and may, therefore, be considered either part of the penetrant or part of the color. In this connection, it should also be pointed out that many colors as sold commercially are dissolved in diluent vehicles. The concentration of active color in any of the foregoing examples is stated on the basis of a pure color undiluted by impurities or commercial diluent vehicles.

Example 7:	*Percent (by weight)*
1. Kerosene	73.5
S. A. E. 50 motor oil	22
2. Alpha-naphthalene-azo-alpha-naphthol	1.5
3. Refined sulphonated aromatic petroleum fractions (approximate empirical formula: $C_{26}H_{25}SO_3Na$; approximate molecular weight: 430)	3

When inspecting test bodies according to the above described methods, it is often desirable to inspect the test body while the testing agent is being drawn or forced out of the flaws in order to obtain a qualitative as well as a quantitative analysis of the flaws. Thus, for example, where the testing agent first appears as a thin colored line and then widens without diminishing in tinctorial strength, a narrow deep crack will be indicated; where the testing agent appears as a comparatively wide line and then diminishes in strength as the line widens, a wide and shallow crack is indicated.

It is also to be understood that this invention, particularly with respect to the testing agent, is not to be limited to the embodiments disclosed, which were given by way of example, but that this invention may be modified and varied by those skilled in the art. For example, whereas the foregoing examples of testing agents show the use of oil-soluble dyes as the coloring material, it is to be understood that, in suitable instances, one may employ in suitable concentrations (usually higher than the concentrations shown for dyes) dyes laked on suitable oil-soluble substrata, such as oil-soluble soaps, or dyes laked on very finely divided oil-insoluble substrata capable of being extremely thoroughly dispersed in a penetrant; indeed, very fine pigments, such as the nigrosines or the Lithol reds, may be suitably dispersed in a penetrant, as by grinding. Accordingly, in the following claims, the term "color material," where used, is a generic term for dyes, lakes, or pigments capable of extremely fine subdivision in penetrants. It is also to be understood that the term "color," as used in this specification and in the following claims, may include black and white. The limitations of this invention, therefore, are not set forth in the foregoing specification but in the following claims.

This application is a continuation-in-part of my joint application with Richard A. Ward for "Detection of Flaws," Serial No. 606,708, filed July 23, 1945, which in turn is a continuation-in-part of its copending application for "Method of Locating Surface Discontinuities," Serial No. 531,648, filed April 18, 1944, and its copending application for a "Method of Locating Surface Discontinuities," Serial No. 446,820, filed June 12, 1942.

What is claimed is:

1. In a method of detecting the presence of flaws in the surface layers of a metallic article, the steps comprising applying to the surface of said article a solution containing an oil and a coloring material, maintaining the solution in contact with the surface for a period of time of sufficient duration that the solution may penetrate said flaws, removing from the surface the solution which has not penetrated said flaws, and applying to the surface a finely divided absorbent material, the presence of flaws in the sur-

face layers of said metallic article being visibly indicated by a coloring of the absorbent material lying adjacent said flaws by the coloring material contained in the solution upon the seeping of the latter out of said flaws onto the surface of the article.

2. In a method of detecting the presence of flaws in the surface layers of a metallic article, the steps comprising applying to the surface of said article a solution containing a penetrating oil and an oil soluble dye, maintaining the solution in contact with the surface for a period of several minutes, removing the solution which is present on the surface, and applying to the surface a finely divided absorbent material the color of which contrasts with the color of the dye, the presence of flaws in the surface layers of said metallic article being visibly indicated by a coloring of the absorbent material lying adjacent said flaws by the dye contained in the solution upon the seeping of the latter out of said flaws onto the surface of the article.

3. The method of detecting flaws in the surface of test bodies comprising the steps of applying to the surface of the test body a solution containing a penetrant and a coloring matter therefor, maintaining the solution in contact with the surface of the test body for a period of time of sufficient duration that the solution may penetrate the surface flaws present, removing from the surface the solution which has not penetrated said flaws, and applying to the surface of the body a second coating solution which absorbs the coloring matter of the first solution retained in and about the surface opening of the flaws.

4. A method as defined in Claim 3 in which said second solution is colored to provide a contrasting background for the coloring matter of the first solution and absorbed by the second solution.

5. In a method of detecting flaws having openings in the surface of articles, the step comprising applying to the surface of said article a solution of a flaw penetrant and a heat-responsive color-producing agent, maintaining the solution in contrast with the surface of said article for a period of time of sufficient duration that the solution may penetrate said flaws, removing from the surface the solution which has not penetrated said flaws, and applying heat to said article to cause the heat-responsive color-producing agent to develop a visible color in and around the surface openings of said flaws and thereby reveal the extent and location thereof.

6. In a method of detecting flaws having openings in the surface of articles, the steps comprising applying to the surface of said articles a solution of a penetrant for said flaws and a first chromogenic reagent, maintaining the solution in contact with said surface a period of time of sufficient duration that said solution may penetrate said flaws, removing from said surface the solution which has not penetrated said flaws, and then applying to said surface a second chromogenic reagent for said first reagent to develop a colored reaction product in and around said flaws and thereby reveal the extent and location of said flaws.

ROBERT C. SWITZER.

OATH

STATE OF OHIO,
County of Cuyahoga, ss:

Robert C. Switzer, the above-named petitioner, being duly sworn, deposes and says that he is a citizen of the United States, residing at South Euclid, in the County of Cuyahoga, and State of Ohio; that he verily believes himself to be the original, first and sole inventor of the improvement in Flaw Detection described and claimed in the annexed specification; that the present application is in part a continuation of an application filed jointly by him and Richard A. Ward in the United States Patent Office on July 23, 1945, Serial No. 606,708; that as to the subject matter common to the present application and to said application, Serial No. 606,708, he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than one year prior to the date of filing of said application, Serial No. 606,708, or in public use or on sale in the United States for more than one year prior to said date; that said invention has not been patented to himself or to others with his knowledge and consent in this or any foreign country for more than one year prior to the date of the filing of said application Serial No. 606,708, or on an application for a patent filed in any country foreign to the United States by himself or his legal representatives or assigns more than twelve months prior to said date; and that no application for patent on said improvements has been filed by himself or his representatives or assigns in any country foreign to the United States except as follows:

Canada	Feb. 6, 1946
Great Britain	July 15, 1946

that as to the remaining subject matter he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than one year prior to this application, or in public use or on sale in the United States for more than one year prior to this application; that said invention has not been patented to himself or to others with his knowledge or consent in this or any foreign country for more than one year prior to this application, or on an application for a patent filed in any country foreign to the United States by himself or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by himself or his representatives or assigns in any country foreign to the United States.

ROBERT C. SWITZER.

Sworn to and subscribed before me this 5th day of April 1949.

HAZEL J. FAWCETT,
Notary Public.

My commission expires April 16, 1951.

Paper No. 16

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE
WASHINGTON

Appeal No. 37,912

BEFORE THE BOARD OF APPEALS

IN RE APPLICATION OF ROBERT C. SWITZER

Examiner's answer

Ely, Frye & Hamilton for appellant.

Ser. No. 85,749. Filed April 6, 1949. For Flaw Detection.

This is an appeal from the final rejection of claims 3 to 11. Claims 1 and 2 have been allowed.

The copy of the claims accompanying the brief is accurate.

The references involved in the examiner's rejection are:

Switzer	2,259,400	Oct. 14, 1941	73/104
Ward	2,405,078	July 30, 1946	250/71
Farbenindustrie (Swiss)	224,242	Feb. 1, 1943	73/104

The description of the subject matter of the invention and of the references in the instant brief when considered with the brief in appeal No. 32,079, still pending before the Board, is adequate except that no mention is made in the instant brief of the Switzer patent.

GROUNDS OF REJECTION

The claims stand rejected on the Swiss patent, taken in view of Switzer; also on the Swiss patent or the Ward alone.

Claim 3 stands rejected as unpatentable over the Swiss patent in view of Switzer. The Swiss patent teaches the use of a penetrant solution of water and alcohol containing a coloring agent visible under daylight conditions. The testing agent is applied to, then washed from the surface of the test price, and the solution exuding from the flaws reveals the location of the defects. The use of absorbing agents is disclosed by Switzer on page 2, first column, lines 5–10 which may be "powdered agents" (page 3, first column, lines 55–60) in liquid form. It is not patentable invention to apply a secondary fixer or developing fluid, as taught by Switzer, to the Farbenindustrie test.

Claim 4 stands rejected as claim 3 above, for if a powdered agent, as described in Switzer above, be used, it inherently has color which will contrast with the chrome-yellow of the Swiss dye.

Claims 7 and 10 stand rejected as fully met by the Swiss patent wherein the specimen is immersed in a coloring bath at about 150° F., removed, washed and thereby cooled, and inspected for flaws.

Claim 8 stands rejected as unpatentable over the Swiss patent, applied above, in that no invention is required to heat both the bath and the specimen, or one or the other.

Claims 7, 8, and 10 stand further rejected and claim 11 stands rejected as unpatentable over Ward. As pointed out in the Examiner's Statement in Appeal No. 32,079, of parent application 607,708, the agents admixed with the penetrant oil have color and are observable under visible light; further, that the emphasis upon a visible light as against a fluorescent agent in response to the complaints of labor, required no inventive ingenuity, but is a corollary.

Claims 5, 6, and 9 are drawn to the non-elected species, and since there is no allowable generic claim, this group stands rejected on the ground of misjoinder.

ANSWER TO APPLICANT'S ARGUMENTS

I. Applicant contends that the Swiss patent is not a valid reference because of its "Actual publication date" (meaning that due to war the Swiss patent was not available in the U. S. Patent Office until Aug. 1946) and that the patent does not teach the invention. The first part of applicant's contention was at issue in Appeal No. 32,079, and the Board held that the Swiss patent was a valid reference from a legal standpoint (see pages 9–10 of the Board's decision). The second part of the contention that the Swiss patent does not teach the invention as claimed, and that the Board sustained this contention in Appeal No. 32,079 is not well founded. The basis for the decision of the Board not to sustain the rejection on the Farbenindustrie patent *per se* is that the claims at issue in that Appeal recited a "Water-emulsifiable" testing agent (see pages 9-10 of the Board's decision). There is no such limitation in the instant case, and the Swiss patent is deemed to be a pertinent reference.

II. Applicant contends that the Ward patent is not a valid reference. This contention also was at issue in Appeal No. 32,079 and attention is directed to pages 4-6 of the Board's decision wherein the Board held that the Ward patent is a valid reference against the parent application Serial No. 606,708.

Respectfully submitted,

A. D. McFadyen,
Examiner.

Ely, Frye & Hamilton,
919 National City Bank Bldg.,
Cleveland 14, Ohio.

Paper No. 21

In the United States Patent Office

Appeal No. 379-12

BEFORE THE BOARD OF APPEALS

Ex parte Robert C. Switzer

Application for Patent filed April 6, 1949, Serial No. 85,749. Flaw Detection.

Ely, Frye and Hamilton for appellant.

Mailed October 14, 1954. U. S. Patent Office Board of Appeals.

Hearing May 5, 1954.

This is an appeal from the final rejection of claims 3 to 11, inclusive. Claims 1 and 2, the only other claims in the case, stand allowed.

Claims 3, 7 and 11 are illustrative and read as follows:

3. The method of detecting flaws in the surface of test bodies comprising the steps of applying to the surface of the test body a solution containing a penetrant and a coloring matter therefor, maintaining the solution in contact with the surface of the test body for a period of time of sufficient duration that the solution may penetrate the surface flaws present, removing from the surface the solution which has not penetrated said flaws, and applying to the surface of the body a second coating solution which absorbs the coloring matter of the first solution retained in and about the surface opening of the flaws.

7. The method, of detecting in a test body subsurface flaws having surface openings, comprising the steps of heating the test body, applying to the surface of the test body a colored testing agent which penetrates the surface openings of the subsurface flaws, cooling the test body, removing the testing agent from the surface of the body, exuding from the surface openings of the flaws a portion of the testing agent which had penetrated the surface openings of the flaws, and then inspecting the test body under visible light.

11. The method of detecting, in a test body, subsurface flaws having surface openings comprising the steps of applying to the surface of the test body a testing agent comprising an oily liquid capable of wetting the surface of the test body and a dye dissolved in said liquid, removing said testing agent from the surface of the test body, allowing the portion of the testing agent which had penetrated said surface openings to exude therefrom, and then inspecting said test body under visible light, whereby the extent and location of the flaws

> will be revealed and magnified by the color contrast between the exuded testing agent and adjacent areas of the test body, the colored dye having been selected to impart a color to the testing agent distinctive from the color of the surface of the test body.

The references relied upon are:

Switzer	2,259,400	Oct. 14, 1941
Ward	2,405,078	July 30, 1946
Farbenindustrie (Swiss)	224,242	Feb. 1, 1943

The subject matter is a process for detecting surface flaws in objects, such as castings. The three quoted claims make the elected subject matter covered by claims 3, 4, 7, 8, 10 and 11 apparent. The noted claims are rejected on the noted references. Claims 5, 6 and 9 are restricted to nonelected species.

This sole application is designated as a continuation-in-part of the joint application of Ward et al 606,708, filed July 23, 1945. The propriety of such designation is not before us.

Appellant contends in this case that the Swiss patent is not a valid reference because it actually became available in this country as a reference after the filing date of the parent case, i. e., the above-noted joint case. This contention was answered in the noted joint case in the decision on Appeal No. 32,079 rendered March 31, 1953, see pages 9 and 10 thereof. With the opinion there stated that the Swiss patent is available as a reference, we agree. Thus, there is no need to discuss this point further in this case.

Appellant further alleges that, since Ward is a party legally different from Switzer, the Ward patent may be removed as a reference by an affidavit under Rule 131. The record shows that the Ward patent is owned jointly by the present applicant and J. L.

Switzer. Thus, the subject matter covered by the claims in the Ward patent may not be removed as a reference, for the reasons stated in Appeal No. 39,691, pages 2 and 3 in the joint application above identified, where a corresponding contention was made, with which reasons we agree.

In a supplemental memorandum filed August 13, 1954, appellant calls attention to *In re Stanley & Lowe* (decided by the C. C. P. A. July 31, 1954), 102 U. S. P. Q. 234 (available after the hearing in the instant case). Appellant alleges that, under this decision, in cases of common ownership the claims must cross read in order for the rejection of one on the other to be proper, and that the claims in the instant application and the Ward patent do not cross read. This same contention was advanced in the joint application. We agree with the reasoning and conclusion there stated, see pages 3 and 4 of Appeal No. 39,691, that this contention is without merit and that the Ward patent, as to the subject matter covered by the claims, may be used as a reference in this case.

Claims 3, 4, 7, 8 and 10 are rejected on the Swiss patent, it being the Examiner's view that these claims are met by this reference except as to the application of an absorbent as recited in claims 3 and 4, which is taught by Switzer.

Appellant argues in his brief, page 2, that the Swiss patent does not teach the invention and that this viewpoint has been sustained by the Board in Appeal No. 32,079 in the joint case already mentioned. In the noted decision on such prior case, the rejection on the Swiss patent, therein referred to as the Farbenindustrie patent, was discussed in the opinion, pages 7 and 8, in which the holding was that the Swiss patent did not disclose a "water-emulsifiable" testing agent, and thus per se did not anticipate the appealed claims. This opinion does not apply to the claims of the instant case which do not contain the "water-emulsifiable" limitation.

As to claims 3 and 4, no reasons were advanced in the brief as to why they were considered patentable over the disclosures of the Swiss patent in view of Switzer. In the "Reply to Examiner's Answer" pages 2 and 3, the application of a second coating solution in claim 3, and its further characterization in claim 4 as contrasting with the coloring material, are alleged to distinguish over the combination proposed by the Examiner, and further, it is alleged that these are the features relied upon by the Examiner to justify the allowance of claims 1 and 2.

It is noted that allowed claims 1 and 2 are not before us. It is further noted that the Examiner in Paper 9, page 1, pointed out two limitations (that he indicated as vital) present in claims 1 and 2 but missing from claims 3 and 4, namely (1) that the penetrant in claims 1 and 2 is an oil, (whereas the penetrant in claims 3 and 4 is broadly recited and readable directly on the penetrant of the Swiss patent) and (2) the absorbent in claims 1 and 2 is a finely divided absorbent material, i. e., in its solid state (whereas claims 3 and 4 recite an absorbent solution). The allowed claims thus involve oil and a solid absorbent, whereas the claims before us involve any prior art penetrant and a coating solution.

The Swiss patent does not disclose the use of an absorbent solution. It is the Examiner's position that Switzer teaches the use of an absorbent (see the disclosure of a secondary agent, page 2, column 1, lines 7 and 8, and page 3, column 1, lines 44 to 47, where the secondary agent action is defined as its "ability to absorb or pull a portion of the primary agent from the flaws of the casting") which secondary agent may be in liquid form (page 2, column 1, lines 54 and 55). It is self-evident that such an absorbent must contrast with the material absorbed, as set forth in claim 4, or the purpose of the Switzer process will be defeated.

We cannot agree with appellant's view, stated in Paper 17, pages 2 and 3, that

> the Examiner's effort to find in Switzer the second absorbtive coating solution, as called for in claim 3, depends entirely upon the lifting of words of that reference out of context, * * *

The disclosure in Switzer, to which we have called attention by page and line, is a clear disclosure that an absorbent can be applied in liquid form to absorb the coloring agent from the flaws to assist in making the test. To follow this teaching, for the same purpose, in the Swiss process would be but an obvious variation thereof. It is noted that the disclosure in Switzer of a liquid absorbent is at least as precise as the disclosure in the instant case, see the specification pages 7 and 8, where absorptive agents are disclosed as French talc in powdered state or in a thin suspension (page 7, last line), a reference to the materials disclosed by another inventor (page 8, line 2), and agents in liquid form (page 8, line 5), which disclosure is in addition to the statements in original claims 3 and 4 that the agent is a "coating solution" (claim 3), "colored to provide a contrasting background for the coloring material of the first solution" (claim 4). We affirm the rejection of claims 3 and 4.

As to claims 7 and 10, it is the Examiner's view that these claims are fully met by the Swiss patent wherein the specimen is immersed in a hot coloring bath and is thus heated, is removed, washed and thereby cooled, and then inspected. As to claim 8, it is the Examiner's view that it is patentably immaterial whether the bath is heated, or the specimen is heated, or both are heated.

Appellant's viewpoint as to patentability over the Swiss patent occurs in pages 3 and 4 of the "Reply to Examiner's Answer." The argument as to claim 7 appears to be (1) that the specimen heating step and immersing step are separate and thus distinguish from the Swiss disclosure of heating the specimen by immersing in the hot coloring bath, and (2) the cooling and washing steps are separate, thus distinguishing from the Swiss disclosure, and finally, the Swiss disclosure employs a short washoff with cold water leaving sufficient heat in the specimen so that it will dry itself. As to claim 8, appellant points out that in the Swiss process, the specimen is not hotter than the bath as recited.

We note that appellant fails to indicate how he considers that claim 10 distinguishes from the Swiss patent. This is apparently a concession that claim 10 does not distinguish in any patentably significant way. A reading of claim 10 on this reference shows that such is the case, this claim not having the heating and cooling steps of claim 7.

As to claim 7, it is noted that the claim is not restricted as to how the specimen is heated and nothing in the claim excludes the heating being because of immersion in a hot bath so as to be simultaneous with applying the coloring agent. Similarly, nothing recited excludes the cooling from being by the washing operation. Further, the degree of cooling is not specified. Under the terms of this claim, after washing, the specimen could retain sufficient heat to assist in drying itself. But, assuming the differences argued to have been defined, they would apparently not change the result insofar as testing for flaws are concerned, and thus if defined would find their full equivalent in the steps of the Swiss patent.

As to claim 8, the Swiss patent immerses a cooler specimen in a hotter bath, rather than a hotter specimen in a cooler bath as recited. Heating opens flaws so as to receive the coloring material, but why heating the specimen prior to immersion in a cooler bath is preferable to having the specimen heating take place because of immersion in a hotter bath, appellant does not say. As to penetration of coloring matter into flaws, the difference in penetration, if any, would appear to be one of degree only, and thus we agree with the Examiner that the Swiss and appellant's variants are equivalents. For these reasons, the rejection of claims 7, 8 and 10 is affirmed.

As to the rejection of claims 7, 8, 10 and 11 on Ward, we note that appellant has not controverted the Examiner's holding that there is nothing patentable in such claims over the claims of Ward. Appellant has only argued that Ward cannot serve as a reference in the instant case.

The Examiner has pointed out in Paper No. 9, pages 2 and 3, why the instant claims are not patentable over what is claimed in Ward. He has pointed out that there is no distinction as to emulsifying agents since Ward has claims *not* so limited. He further notes that some fluorescent agents have color visible in daylight, thus are "colored" agents within the terms of the claims of the instant case. We have considered the claims of Ward and claims 7, 8, 10 and 11 of the instant case and find that the Examiner's uncontroverted position is correct. We thus affirm the rejection of claims 7, 8, 10 and 11 on Ward.

The decision of the Examiner is affirmed.

L. P. McCann,
Examiner-in-Chief,
M. H. Friedman,
Examiner-in-Chief,
M. F. Bailey,
Examiner-in-Chief (Acting),
Board of Appeals.

Ely, Frye & Hamilton,
919 National City Bank Bldg.,
Cleveland 14, Ohio.

October 11, 1954.

Paper No. 23

In the United States Patent Office

Appeal No. 379–12

BEFORE THE BOARD OF APPEALS

Ex parte Robert C. Switzer

Application for Patent filed April 6, 1949, Serial No. 85,749. Flaw Detection.

Ely, Frye and Hamilton for appellant.

Mailed November 30, 1954. U. S. Patent Office Board of Appeals.

On petition for reconsideration

A petition has been presented requesting reconsideration of our decision of October 11, 1954, affirming the action of the Examiner finally rejecting claims 3 to 11, inclusive.

As to the reliance upon Ward as a reference, appellant contends that there is no common ownership as between the Ward patent and the present application such as is necessary to support a rejection on the ground of double patenting. He states that the ownership of the Ward patent rests in R. C. Switzer and J. L. Switzer as joint tenants, while ownership of the instant application is solely in R. C. Switzer. Because of this, appellant urges that it cannot properly be said that there is common ownership.

A similar allegation was made in a petition for reconsideration, filed on October 25, 1954, in the joint case of Ward, Appeal No. 32,079, to which we referred in our original decision. We, however, agree with the reasoning there employed and the conclusion there reached and consider the same to apply to the facts in the instant case which are here repeated as they apply to the facts of this case. That the interests of R. C. Switzer are different in the patent and application may be admitted. R. C. Switzer is one of the owners of the patent and is the sole owner of the application and thus is the common owner. In our opinion, it is sufficient basis for sustaining a rejection in double patenting if there is a common party of interest, even though there may be a qualitative or quantitative difference in his interest in the patent and application, respectively.

Appellant also urges, as was also urged in the noted joint case, that our decision was improper in view of *In re Stanley & Lowe,* 41 C. C. P. A. ——, 102 U. S. P. Q. 234. However, no argument has been presented as to why appellant considers our original decision to be in error. Appellant only states the general conclusion (see petition, page 2) that he thinks:

> that Ward does not meet the standards necessary for a prior patent to support a rejection on double patenting, as set up by the Court of Customs and Patent Appeals.

For the reasons already advanced in our decision, we consider that Ward fully meets the standards necessary and as set forth in such decision.

Appellant also urges (petition, page 2) that:

> the rejection on Ward finds no support, in view of the affidavit under Rule 131, under 35 U. S. C. 102.

The basis of the practice stated in the Stanley and Lowe decision and other related decisions is that no party of interest can swear back of his own interest by an affidavit under Rule 131.

Appellant notes that, in our reference to the Switzer patent on page 5 of our decision, we erroneously refer to page 2, column 1, lines 54 and 55. Appellant is correct in this respect since it should have read page 3, column 1, lines 54 and 55. This error is regretted.

In the arguments relative to claims 3 and 4 in the petition, pages 2 through 5, appellant appears to argue that if claims 1 and 2 are allowable so are claims 3 and 4. As we noted in our decision, claims 1 and 2 differ from claims 3 and 4 and claims 1 and 2 are not before us. Patentability of appealed claims 3 and 4 is not controlled by claims that are allowed, but must be determined on their own merits. *In re Bisley,* 39 C. C. P. A. 982; 94 U. S. P. Q. 80; 665 O. G. 639; 1952 C. D. 298. *In re Andrus,* 28 C. C. P. A. 1113; 530 O. G. 268; 1941 C. D. 497.

Appellant argues that we overstated appellant's claims when, in the last two lines of the paragraph ending at the top of page 5 of our decision, we stated that claims 3 and 4:

> involve any prior art penetrant and a coating solution.

This statement should not be taken alone. As to the penetrant it should be read in connection with the preceding statement on page 5 and in the same paragraph:

> the penetrant in claims 3 and 4 is broadly recited and readable directly on the penetrant of the Swiss patent,

and as to the absorbent, it should be taken in connection with the following paragraph which points out by page, column and line (one of which is above corrected) the disclosure in Switzer of an absorbent solution.

It was and still is our opinion that the use in the process clearly disclosed in the Swiss patent of an absorbent solution for the purpose of absorbing coloring matter from the flaws, as clearly taught by Switzer, would be but to vary the process of the Swiss patent in an obvious manner, which variation is taught by the prior art in a manner as precise as it is taught in the instant application (see the decision, pages 5 and 6). There is nothing in the present petition that persuades us that there is any error in such decision.

As to the rejection of claims 7, 8, 10 and 11 on Ward, appellant alleges error in our statement, starting at the top of page 8 of our decision, that:

> we note that appellant has not controverted the Examiner's holding that there is nothing patentable in such claims over the claims of Ward. Appellant has only argued that Ward cannot serve as a reference in the instant case.

The first point that appellant makes, page 5 of the petition, is that he has removed Ward as a reference by an affidavit under Rule 131. This does not pertain to patentability over the Ward claims. It only pertains to the alleged removal of Ward as a reference. which we have elsewhere considered.

Appellant now argues that claims 7, 8, 10 and 11 are patentable over Ward on the ground that the Ward disclosure does not suggest that fluorescigenous radiation can be omitted from the process there disclosed.

This argument is not pertinent to the rejection made which is that the claims are not patentable over the *claims* of Ward. Various of the method *claims of Ward are not limited to the use of fluorescigenous radiation;* thus, there are claims that are sufficiently broad to include the omission of such radiation (see, for example, claims 1 and 15 which do not include such step which is present in dependent claim 2).

The argument, on page 6 of the petition, that nothing about nonfluorescent color is mentioned in the Ward claims is also nongermane to whether the claims of Ward and the claims of the present application are patentably different. Even if every claim in Ward is restricted to fluorescent color, they do not differ in a patentable respect from claims 7, 8, 10 and 11 of the instant case, which by reciting only "a colored testing agent" or "a testing agent containing a dissolved colored dye" or "a testing agent comprising * * * a dye" read upon the colored fluorescent agents and dyes also covered by the Ward claims. Even if the following allegation on page 6 of the petition is accepted:

> None of the pentrants disclosed in Ward are of sufficient tinctorial strength to be operative in appellant's method, a naked assumption by the Examiner which appellant has never conceded.

a complete answer is that the claims do not distinguish from such agents, since they are not limited as to degree of "tinctorial strength" nor do they, in any other way, exclude such colored agents. Thus, the claims fail to define an invention different from Ward.

The argument presented, starting on page 6 of the petition, as to the rejection of claims 7, 8, and 10 on the Swiss patent, on the ground that it is not a reference, has been fully answerd. We adhere to our position.

The argument as to the rejection of claims 7 and 8 on the Swiss patent, on page 7 of the petition, has also been fully answered in our prior decision. We adhere to our position.

The petition is granted to the extent that we have reconsidered our decision but it is denied with respect to making any change therein, except for the correction of a typographical error in identifying page 3, column 1, lines 54 and 55 of the Switzer patent.

L. P. McCann,
Examiner-in-Chief,
M. H. Friedman,
Examiner-in-Chief,
M. F. Bailey,
Examiner-in-Chief (Acting),
Board of Appeals.

Ely, Frye and Hamilton,
919 National City Bank Bldg.,
Cleveland 14, Ohio.

November 30, 1954.

Patented October 14, 1941

United States Patent Office

2,259,400

FLAW DETECTION

ROBERT C. SWITZER, CLEVELAND, OHIO

No Drawing. Application August 17, 1938, Serial No. 225,421

13 Claims (Cl 250—71)

This invention relates to improvements in methods of detecting physical flaws in metallic bodies. More specifically, it relates to rapid and nondestructive tests for the location of cracks, blow-holes, leaks, piping, seams, shrinkage cavities and other defects in metallic articles.

It is of paramount importance in the metallurgical industries today that physical flaws be substantially eliminated in metallic products required to bear stress and withstand impact and wear, for it is recognized that failure of such metal products in service, with the resultant expense, damage and possible loss of life, is often attributable to hidden physical defects. The adoption in numerous plants of X-ray, electrical, microscopic and magnetic examination methods, as well as other expensive inspection techniques, indicates that the problem is of considerable consequence. Many varied magnetic devices, for example, have been proposed to explore metal products for detection of physical flaws by determination of their magnetic uniformity, and while generally slow, laborious and substantially unsatisfactory for examination of nonferrous metals, they do offer decided improvements over the crude mechanical and visual inspection means often employed heretofore. In spite of many such recent developments, however, rapid, nondestructive and accurate methods of detecting flaws in production runs are needed, and it is an object of this invention to provide such methods.

The necessity for the detection of defective products is common to many branches of the metal industries. It is imperative that shrinkage cavities, blow-holes, cracks, cold shuts and the like be located in certain cast products; it is likewise important that pipings, blisters, and other characteristic defects be located in some forged and rolled products; it is necessary that fissures due to rupture or the failure of folds to weld be located in drawn products, etc. For the purpose of illustration only and not by way of limitation, the invention is herein described as applied particularly to the detection of physical flaws in metal castings, although it is to be understood that it may be applied to any metal products.

In the case of foundries shipping castings to their customers in a nonfinished state for subsequent machining in the customer's plant, considerable difficulty is encountered in locating minute and hidden flaws prior to the initial shipping of the castings, as numerous physical flaws do not become visible until the outer casting surface is removed by machining. Thus, the responsibility of rigid inspection falls upon the buyer of the rough castings, who must mark the location of flaws revealed on defective castings, pack the rejects for shipment and return them to the foundry for remelting. In some cases, more than seventy-five percent (75%) of the castings originally shipped by foundries are returned due to such revelation of hidden flaws by machining. It is a further object of this invention to provide means of detecting such flaws prior to initial shipment of the product, thereby saving the costs of shipping defective castings to the customer as well as eliminating the expense of machining, handling and returning rejected castings to the foundry.

In normal practice today, flaws may not be revealed until subsequent machining weeks after pouring, and thousands of castings containing the same type of flaw may conceivably be poured and shipped during this interim with no effort being made to remove the cause of the hidden flaws. Another purpose of this invention is to provide means for detecting such hidden flaws rapidly and accurately within a short time after pouring, thus facilitating the taking of immediate steps to eliminate the cause of the flaws in subsequent pourings during the same run, and thereby reducing the considerable expense of pouring, handling and shipping large quantities of defective castings.

In the general practice of this invention in the metal casting industries, for example, rough castings are removed from the molds and, if necessary, are cleaned by abrasion in tumbling mills. The castings are then immersed, coated or otherwise treated with an identifiable agent, usually in solution, in such a manner that the agent penetrates the cracks, tears and other cavities in the castings. The agent used is generally carefully selected as being capable of exhibiting some distinctive luminescent property, reaction or diverse characteristic not exhibited by the casting material, by which it may be readily identified and differentiated from the casting surfaces. If the agent be applied as a fluid, it may be heated and pressure may be employed to increase its rate and depth of penetration into the fissures and cavities of the castings. After castings are treated, the agent is removed from the external surfaces by such methods as draining, wiping or shot-blasting, to leave clean metal surfaces in the proper condition for routine inspection. The distinctive agent which has penetrated the flaws then tends to seep slowly from the flaws, especially if it has been carried in an oily vehicle, and is subsequently identified by its contrasting luminescent properties, thereby automatically revealing the location of surface outlets of large as well as small and otherwise hidden flaws. Treated and cleaned castings may sometimes be treated with a second agent which fixes, absorbs, is dyed by, or otherwise reacts characteristically with the first agent remaining in and about the flaws to form, in the loci of the flaws, a reaction product which differs from the adjacent surfaces in some distinctive luminescent aspect and is thus readily detectable as an indicator of the position of physical flaws. The processes of treating castings with identifiable agents thus fall roughly into two classes; first, treatment with single agents, and secondly, treatment with a plurality of agents which depend more or less upon interaction for the production of a distinctive luminescent indicator.

Treatment of cast products may be accomplished in numerous ways, the method depending upon the state of finish and composition of the product involved, the maximum treating time and maximum cost permissible in a particular plant, fluctuations in the cost of materials, and other factors which may vary with each product and foundry. In the majority of cases, castings are immersed in solutions of identifiable agents, although they may be sprayed or brushed, and in some instances subjected to treatment with vapors, gases or fine powders. The rate and depth of penetration required in each specific instance are necessary considerations in the choice of method utilized, and the employment of super-atmospheric temperatures and pressures to increase both factors are important embodiments of this invention. If solutions in immersion tanks, for example, are heated or kept under high pressure with pumps, the penetration of flaws by the agent will be accelerated and often effected in minute flaws which would not otherwise be reached. To those versed in the nearest associated arts, it will be apparent that the viscosity, surface tension, and other characteristic properties of each material under consideration will likewise have consequential bearing upon the rate and depth of penetration. In general, light oils and other oily solvents appear to be very practical carriers for identifiable agents, as they penetrate readily and have a natural tendency to bleed or spread from flaws after immersion.

It has been found most advantageous in some cases to immerse and heat castings in solvents supersaturated at elevated temperatures with normally crystalline or solid chemicals, the solubility of which is measurably increased by the rise in temperature effected. If castings so treated are cleaned while hot, the recrystallization and precipitation of such chemicals as the solution cools is most beneficial, for the precipitate formed tends to pile up about the surface outlets of flaws as an unmistakable indicator of their locations. If certain normally solid, meltable substances, as petrolatums and waxes, are carried with the normally crystalline agents in a heated mutual solvent, it has been found that the cooling of the casting and precipitation of the agent is accompanied by the solidification of the meltable substance, which then serves as a solid binder for the precipitate that accumulates about the flaw outlets.

Treated castings may be drained in web baskets, on conveyors, in hot air blasts or ovens, in centrifugal dryers, etc., although in many cases, sufficient draining takes place as the castings are transported to the cleaning department, especially if the castings have been raised to an elevated temperature during treatment. Draining is normally followed by immediate and complete removal of the remainder of the agent from the external surfaces of the product and here, as before, the cleaning methods employed in each case will depend largely upon the composition of the product as well as the finish desired. Rough castings may be readily cleaned by impact with shot in the orthodox shot-blasting machines which utilize air or centrifugal force to throw a continuous stream of shot; other products may be cleaned by abrasion with sand-blasting equipment or tumbling mills; and still other products may require solvent cleaning, air cleaning, wiping, brushing, etc. The castings may be inspected at any reasonable time after cleaning. The location of flaws is revealed by the identifiable luminescent agent, for the agent seeps from the flaws to the immediately adjacent cleaned surfaces, sometimes leaving the agent virtually "piled" around the surface openings of the flaws. The "bleeding" or seeping of the agent from the flaws may be hastened in any suitable manner, as by whirling the cleaned castings or striking them with sharp hammer blows, but a sufficient amount of the identifying agent will generally appear when cleaned castings are allowed to stand for a period of time before final inspection.

Treated and cleaned castings are normally inspected under a viewing condition so designed and controlled in each specific case as to cause maximum contrast between the cleaned casting surfaces and the particular extraneous substance retained in and about or seeping from the surface outlet of the flaws. It naturally follows that castings treated with any one agent, chosen because of its diverse and characteristic response to one particular form of radiant energy, for example, must be subjected during examination to the action of such energy. If castings are treated in other foundries with agents chosen because of their distinctive and characteristic luminescent response to light, such as monochromatic light carefully controlled as to intensity and direction of incidence, other visible light should be excluded during the final inspection of the castings so treated, and it has been found that colored gelatine light filters in combination with common light sources will provide monochromatic light practically in some some cases. If, in still some instances, castings are treated with agents consisting of hot penetrating oils saturated with dyestuffs which cause the solutions to become vividly fluorescent during exposure to fluorescigenous radiant energy, inspection should normally be carried out in darkened or semi-darkened locations flooded with ultra-violet light from which visible light has been substantially filtered, for under this conditon a maximum in contrast is effected between dark, non-fluorescent casting surfaces and the luminescent stains about flaw openings.

The utilization of varied fluorescent agents and inspection during exposure of the cleaned castings to filtered fluorescigenous radiant energy normally reveal the location of such flaws as cracks and tears by vivid light-emissions from jagged, uneven and ofttimes blurred fluorescent lines, while larger cavities, sections of porous metal and the like are revealed by colored light emitted by fluorescent smears and accumulations of fluorescent matters which often increase in size as the castings are allowed to stand. Fluorescigenous radiant energy for the excitation of various fluorescent agents is produced by X-ray tubes, cathode-ray tubes and carbon-arc equipment, as examples, but high-intensity quartz mercury arc lamps are generally employed at the present time. If the radiations from such a source are filtered through "Corex," for example, properly colored in accordance with known practices in the vapor lamp industry to substantially absorb the visible light produced by the lamp and to pass a maximum of the invisible ultra-violet radiations, cleaned casting surfaces will ordinarily appear very dark purple or black during exposure to same and fluorescent indicators will exhibit maximum visibility. Such quartz mercury arc burners, fitted with proper filters and reflectors, provide excellent production means for causing intense fluorescence in a very wide range of commercially available substances, as they are high in output of comparatively short-wave as well as long-wave ultra-violet radiations.

The treatment of metal products with a plurality of agents usually consists, firstly, in the application of primary agents in the general manner heretofore described for single agent treatment, and secondly, in the application of secondary agents reactive with the primary substances retained in and about the flaws to form, in the proximity and loci of the flaws, a reaction product differing from the adjacent metal surfaces in some distinctive luminescent characteristic, as in its response to a particular form of radiant energy. Such secondary agents may take the form of "fluorescence developers" which, upon inter-action with carefully selected primary agents, form a product capable of exhibiting brilliant fluorescence under filtered ultra-violet light; they may also take the form of coatings or fixatives, which "fix" or preserve the distinctive reaction product formed in the locality of flaws, etc. In some cases, the secondary agent may depend for its action upon its ability to absorb or pull a portion of the primary agent from the flaws of the casting; in certain instances, the secondary treatment may take such specialized form as heat or gas application, etc., while at other times, the secondary agent may serve the dual purpose of identifying the primary agent and also acting as a protective coating for the metal product, thereby minimizing such actions as rust and abrasion. Secondary agents in liquid form may be applied by such means as immersion, brushing or spraying, whereas the application of powdered agents may entail blowing, dusting, tumbling, and the like. The methods of application employed with each particular combination of primary and secondary agent depend largely upon the specific function of each of the inter-acting agents, as well as upon numerous other factors previously described as governing the choice of application methods used with single agents. It is intended that the term "react" as herein used is to be interpreted in its broadest sense, and that it include "to cause physical or chemical transformation or change" as well as "to act in response," and "to exert counteracting influence."

The viewing condition for inspection of metal products treated with a plurality of agents must necessarily be so designed in each instance as to include lighting conditions under which the luminescent reaction product of any plurality of agents responds diversely from the response of the article being treated. If the agents used have been designed to produce distinctive fluorescence in the proximity of defects, metal products treated with same will generally be viewed in darkened locations under filtered fluorescigenous energy radiated by the most convenient type of equipment available. In all cases, where the plurality of agents used have been designed to produce a luminescent reaction, metal products treated with them will generally be examined under lighting conditions chosen to cause the greatest possible contrast between the broad metal surfaces and the areas where distinctive luminescent change has occurred.

It should be very apparent to those versed in the nearest associated arts that the above-described embodiments of this invention are indicative of but a few of the many varied ways in which the principles of this invention may be employed, and it is to be understood that many omissions, alterations and replacements in the procedures and techniques above-described may be made without departing from the intended broad spirit and scope of the invention. To further describe the invention and to demonstrate the many variations possible in materials used, technique employed and results obtained, the following illustrative but in no way limitative examples are cited

Example 1.—A very successful series of single agent detection methods comprise treatment of metal products with solutions capable of fluorescing in the fluid state and subsequent inspection of the cleaned articles under filtered fluorescigenous radiant energy. Many naturally fluorescent solutions have been used for this purpose, as have numerous fluorescent solutions prepared by the addition of certain fluorescent "concentrates" to substantially colorless oils and other solvents.

Lubricating oils almost without exception fluoresce to some extent, and most Pennsylvania and other oils exhibiting a high "bloom" fluoresce vividly upon exposure to fluorescigenous radiant energy; numerous oils of this kind have thus been used for the purposes of this invention without the addition of artificial fluorescent "concentrates." The concentration of fluorescent materials contained in most naturally fluorescent oils is not usually high, and when these oils spread out about the surface outlets of flaws, the fluorescence of the thin films in filtered ultra-violet light is not generally of marked intensity. Therefore, naturally fluorescent oils may not give the conclusive results possible with solutions to which relatively high percentages of fluorescent materials have been added.

Example 2.—The term fluorescent "concentrate" as herein used is intended to include materials which are capable of fluorescing in their dry, solid form and also those which are capable of fluorescing when in combination with other substances. The fluorescent "concentrates" used in the formulation of vividly fluorescent treating oils may take many varied forms, and may include, for example, the "green bloom extracts" normally added to lubricating oils to produce an artificial "bloom." A satisfactory extract of this nature is easily made by first distilling cracked asphalt residuum to bottoms having a melting point in the neighborhood of 350° F. to 400° F., and subsequently digesting the bottoms in lubricating oil.

Oil solutions which exhibit a range of fluorescent colors are readily produced by saturating light oils with a series of fluorescent "concentrates" sold commercially in convenient powdered form; the "Flurol" powders sold by the General Dyestuff Corp. of New York, N. Y., and the "H–W Dye" sold by Wilmot and Cassidy, Inc., Brooklyn, N. Y., are characteristic. They are soluble in a very wide variety of oils and other solvents, but give best results generally when used in non-oxidizing and substantially colorless solvents.

Example 3.—A very successful flaw detection procedure comprises treatment of castings with oil saturated with fluorescent "concentrates" which exhibit vivid fluorescence in crystalline form. In this procedure, it is important that a maximum of fluorescent "concentrate" be dissolved in the oil, and it has been found that such steps as the heating of the oil and the addition of moderate percentages of petrolatums or waxes, for example, aid considerably in concentrating the solution. Customarily, castings are immersed in the hot supersaturated solution and heated in some cases to a temperature approaching that at which the oil is maintained, and then they are removed and cleaned. Best results have been obtained by cleaning the treated castings before they had had an opportunity to cool, for the subsequent cooling after cleaning has been found to expel much of the oil solution from the flaws and to cause rapid recrystallization of the fluorescent "concentrates," which then piles or accumulates about the surface apertures of the flaws to produce an unmistakable fluorescent indicator that continuously increases in the intensity of its fluorescence as more "concentrate" is carried from the flaw opening. "Fluorol V Powder" dissolved in kerosene, paraffin oil, commercial ink oil and the like, has been used successfully in the above-described procedure; other "concentrates" which exhibt brilliant fluorescense in crystalline form and may be applied in common oil-like solvents are 2-aceto-1-naphthol, dibenzanthracene, methyl cholanthrene, anthrohydroquinone diacetate, fluorenone, anthracene, phenanthrene, etc.

Example 4.—It may be found advantageous in some instances to employ solvents other than oils in the formulation of solutions which are fluorescent in the fluid state. A combination of glycerine and alcohol fluoresces a vivid red upon addition of a small amount of tetra-ethyl-diamino-o-carboxyphyenyl-xanthenyl chloride. Similarly, tetra-methyl-diamino-diphenyl-ketonimine hydrochloride causes green fluorescence in mixtures consisting of a few parts of white shellac in many parts of an alcohol; diamino-stilbene-di-sulphonic acid in aqueous solutions of dextrine and glycerine floureses a brilliant whitish-blue; fluorescein diacetate exhibits intense yellow fluorescense in alcoholic potash; 1-naphthol-4-sulfonic acid fluoresces a vivid blue in basic solutions; 1-napthylamine-6 and 7-sulfonic acids fluoresce blue-white to blue-green in alcoholic potash; beta-naphthoquinaldine exhibits whitish-yellow fluorescence in dilute acetic acid; resorcinol succinein fluoresces yellow to yellow green in alcohols, dilute acids, dilute bases, etc., and sodium-beta-naphthaquinoline-sulfonate fluoresces blue in dilute acid and leaves a yellow-green fluorescing compound when applied in alcoholic potash.

Example 5.—An important embodiment of this invention comprises the treatment of metallic bodies with a plurality of agents which form, in the proximity of flaws, a reaction product that fluoresces distinctively upon exposure of the treated body to filtered fluorescigenous radiant energy. For example, castings may be treated primarily with a solution of tetra-methyl-diamino-diphenyl ketonimine hydrochloride in a high boiling point alcohol, then cleaned, and subsequently treated with a fluorescence "developer," such as a coating material consisting of lithopone ground into an alcoholic solution of white shellac. In this case, neither the primary nor secondary treating solutions are fluorescent, but a fluorescent reaction product is formed where the secondary agent absorbs and is dyed by the primary agent remaining in and about the flaw openings after cleaning. Thus, the locations of flaws are readily revealed during exposure to filtered ultra-violet light by vividly fluorsecent lines and smears.

Example 6.—A modified flaw detection procedure likewise requiring the use of ultra-violet light during final inspection entails, firstly, the immersion of metallic bodies in a common solvent such as water or alcohol, secondly, the thorough drying of the external body surfaces, and thirdly, the tumbling of the bodies in a container partially filled with a fine, dry powder which forms a fluorescent product upon its absorption of any of the primary treating solvent remaining in and about the surface openings of flaws. A fine, dry dust composed of powdered tetra-ethyl-diamino-o-carboxyhenyl-xanthenyl chloride ground in white flour or powdered sugar will not fluoresce in dry form, but will absorb moisture readily to produce a sticky compound which fluoresces a brilliant red. Tumbling of the metallic bodies in such a dust usually results in the formation of a fluorescent indicator on their surfaces in the proximity of flaw openings, and subsequent examination in filtered ultra-violet light readily reveals the locations of flaws by fluorescent lines and smears.

I claim:

1. The method of detecting flaws in a metallic body, comprising treatment of the body with a primary agent capable of penetrating the flaws, removal of the agent from the external body surfaces, and treatment of the body with a second agent reactive with the primary agent to form a product in the proximity of flaw surface outlets differing from the body surfaces in response to ultra-violet radiations.

2. The method of locating flaws in metallic bodies, comprising treating the bodies with a substance capable of penetrating the flaws, cleaning the substance from the external body surfaces, treating the bodies with another substance which, in combination with the first substance retained in the flaws and about flaw surface openings, becomes distinctive from adjacent body surfaces in response to fluorescigenous

radiant energy, and subsequently exposing the bodies to the action of fluorescigenous radiant energy.

3. The method of detecting flaws in metallic bodies, comprising treatment of the body with a compound under superatmospheric pressure and heated to superatmospheric temperatures, whereby a portion of the compound is forced into existing flaws, removal of the compound from external body surfaces, and treatment of the body with a secondary compound which reacts with the primary compound retained in and about the flaws to form a fluorescent reaction product.

4. In a process of locating flaws in metallic bodies, the step which comprises producing a reaction between an agent retained internally of the flaws and an agent applied to the external body surfaces, whereby a fluorescent product is formed in the loci of flaw openings.

5. The method of detecting subsurface flaws in a substantially solid body comprising the steps of applying to the outer surfaces of the body a luminescent substance which will penetrate into the surface openings of the subsurface flaws and which is distinguishable from the surface of the body, removing the portion of the substance remaining on the outer surfaces of the body and then inspecting the surface of the body for the portion of the luminescent substance which had penetrated into the surface openings of the subsurface flaws and which reappears on the surface of the body.

6. The method of detecting subsurface flaws in a substantially solid body comprising the steps of applying to the outer surfaces of the body a fluorescent substance which will penetrate into the surface openings of the subsurface flaws, removing the portion of the substance remaining on the outer surfaces of the

body, and then subjecting the body to fluorescigenous radiations, whereby the fluorescence of the substance which had penetrated the subsurface flaws will reveal the location of the subsurface flaws in the body.

7. The method of detecting subsurface flaws in a substantially solid body comprising the steps of applying to the outer surfaces of the body a fluorescent liquid which will penetrate into the surface openings of the subsurface flaws, cleaning the body by removing a portion of the outer surface of the body and the fluorescent liquid applied thereto, allowing the body to stand until some of the fluorescent liquid which had penetrated the surface flaws is exuded from the flaws, and then examining the cleaned surface under fluorescigenous radiations whereby the fluorescence of the liquid exuded upon the cleaned surface will reveal the presence of subsurface flaws.

8. The method of detecting flaws as defined in claim 6 including the step of heating the fluorescent substance.

9. The method of detecting flaws as defined in claim 6 including the step of subjecting the fluorescent substance to pressure.

10. The method of detecting flaws as defined in claim 6 including the steps of subjecting the fluorescent substance to heat and pressure to force the fluorescent substance into the surface openings of the subsurface flaws.

11. The method of detecting flaws in a substantially solid body comprising the steps of applying to a surface of the body a fluorescent oil which will penetrate into the surface openings of the flaws, cleaning the surface of the body to remove the fluorescent oil thereon, subjecting the cleaned body to heat, and then subjecting the body to fluorescigenous radiations,

whereby the presence of flaws will be indicated by the fluorescent oil exuded from the surface openings of the subsurface flaws.

12. The method of detecting flaws in a body comprising the steps of applying to the body a liquid which will penetrate the surface openings of subsurface flaws, which liquid carries a fluorescent substance, removing the liquid from the surface of the body, and subsequently subjecting the surface of the body to fluorescigenous radiations, whereby the presence of the flaws in the body will be revealed by the fluorescent substance carried into the flaws by the penetrating liquid and which reappears on the surface of the body after the liquid has been removed from the surface.

13. The method of detecting flaws in a body comprising the steps of applying to the body a luminescent substance in a liquid state which will permit the substance to penetrate the surface openings of subsurface flaws in the body, removing the substance from a surface of the body, and then subjecting the surface to exciting radiations, whereby flaws will be revealed by the presence of the luminescent substance at the surface openings of the subsurface flaws on the surface of the body.

ROBERT C. SWITZER.

Patented July 30, 1946

United States Patent Office

2,405,078

METHOD AND COMPOSITIONS FOR LOCATING SURFACE DISCONTINUITIES

RICHARD A. WARD, CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ROBERT C. SWITZER, SOUTH EUCLID, OHIO, AND JOSEPH L. SWITZER, CLEVELAND HEIGHTS, OHIO

No Drawing. Application April 18, 1944,
Serial No. 531,648

28 Claims (Cl. 250—71)

This invention relates to improved methods and agents for locating surface discontinuities or flaws in test bodies. The United States Patent No. 2,259,400, granted to Robert C. Switzer on October 14, 1941, for Flaw detection, discloses methods of detecting subsurface flaws in substantially solid bodies comprising the steps of applying to the surface of the test body a luminescent testing agent which will penetrate the surface openings of subsurface flaws, removing the portion of the luminescent testing agent remaining on the surface of the body and then inspecting the surface of the body for the portion of the testing agent which had penetrated into the surface openings of the subsurface flaws and which reappears at or on the surface of the body. This invention, more particularly, relates to an improvement in the foregoing Switzer method and to an improved testing agent for use in the said Switzer method and this improved method. This application is a continuation-in-part of the copending application, Serial No. 446,820, filed June 12, 1942.

The aforesaid Switzer method has been a particularly successful nondestructive testing method for locating surface discontinuities, such as blow-holes and the like in cast bodies, and fatigue cracks, grinding cracks and the like in finished bodies. An especial advantage of the aforesaid method is that the composition of the test bodies generally has no effect on the efficacy of the method. The method has been employed successfully for locating surface discontinuities in nonmetallic bodies as well as in both magnetic and nonmagnetic metallic bodies. Due to the theoretically infinite contrast ratio afforded by the light-emitting testing agent and the nonluminescent body when the article is, in the preferred embodiment of the method, inspected in an absence of incident visible light, fine surface cracks are easily seen with the naked eye even though such surface cracks are substantially submicroscopic in size and cannot be readily detected by visual or X-ray inspection.

Several problems have arisen in the production testing by the aforesaid Switzer method of finished metal parts, for example, particularly when the determination of the extent and location of substantially submicroscopic flaws is sought. First, very fine cracks, particularly those having only a short surface opening, are penetrated very slowly by the testing agents. Second, as a corollary, when the testing agent penetrates fine cracks very slowly, the testing agent will reapper at or on the surface very slowly. Third, it is another almost universal corollary that testing agents which will penetrate such fine cracks will also have great surface wetting properties and are, consequently, difficult to remove from the surface of the bodies being tested so that false indications will not be obtained.

Fourth, in order to remove such thorough penetrating agents without affecting or destroying the finished surface of the body, suitable solvents or the like may be employed, but such solvents are usually expensive and large quantities must often be employed. Fifth, in removing the testing agent from the surface of the body, care must be exercised so that the testing agent will not also be removed from the flaws to be detected.

It is the object of this invention to overcome the foregoing problems to improve the speed and convenience of production testing. Specifically, it is an object of this invention to provide a method or procedure which will accelerate not only the penetration of the testing agent into the flaws in the body being tested, but also the removal of the testing agent from the surface of the body and the reappearance on the surface of the body of the testing agent retained in the flaws. It is another object of this invention to provide a suitable testing agent which will rapidly penetrate the openings of fine flaws but which may be rapidly and thoroughly removed from the surface of the test body by inexpensive agents without being removed from the flaws in the test body. These objects are accomplished by heating the test body, cooling the test body in a water-emulsifiable luminescent testing agent, washing the testing agent from the test body, reheating the test body and/or applying an absorbent for the testing agent to the surface of the cleaned test body. The test body is then inspected under suitable lighting conditions as prescribed in the aforesaid Switzer patent.

Admittedly, this improved method of testing may not appreciably increase the ultimate accuracy of the testing method disclosed in the aforesaid Switzer patent nor do the testing agents as disclosed herein necessarily reveal any finer flaws. By testing according to this invention, however, one may obtain very rapid results which satisfy most practical standards and which also approach, if not equal or exceed, the ultimate accuracy of the methods as disclosed in the aforesaid Switzer patent. Any additional steps required by this invention are generally more than offset by its suitability to rapid and efficient production testing.

Other objects and advantages of this invention will be apparent from the following detailed specification and the claims.

In general, the method of testing according to this invention comprises five preferred steps which may be carried out in several different ways. The five preferred steps are: first, heating the test body; second, cooling the test body while at least the portion of the surface to be tested is covered with a flaw-penetrating testing agent which is luminescent and usually fluorescent under suitable invisible fluorescigenous radiation and which is also preferably but not necessarily water-emulsifiable; third, removing the portion of the testing agent remaining on the surface of the body, as by flushing the body with water when the preferred water-emulsifiable agent is used; fourth, driving or drawing on or to the surface of the body a portion of the testing agent retained in the flaws; and fifth, inspecting the test body under suitable lighting conditions which will permit the location and extent of flaws to be revealed by the light emitted by the luminescent testing agent reappearing at or on the surface of the test body. Specific examples of each of the steps are given below, but it is to be understood that the following examples are given by way of illustration and are not to be considered as limitations.

The body to be tested is preferably cleaned prior to heating. If the test body is a machined and finished metal part, for example, the suitable temperature to which it is heated can usually range between 90° and 160° C. Several factors must be taken into account to determine the maximum temperature to which the test body is to be heated, such as, for example, the physical deformation and stresses caused by heating, the effect on the temper of the body of the heating and subsequent cooling, the baking or carbonization, on the surface and in the flaws of the body, of residual films of cutting oil and the like, the oxidation of the surface of the body, and the dissociation, volatilization and flash point of the testing agent which may be applied to the heated body. The test body can usually be heated quickly by soaking it in a vat of boiling water, although superheated steam, ovens, infrared radiation, induced electric currents, hot solvents which may remove surface films, or other equivalent means, may be employed where expedient. When the test body is very large or unwieldy, localized areas, rather than the whole body, may be heated. If the body is heated with a liquid, it is often preferable to dry the body by superheated steam, hot air, or simply allowing the heat of the body to vaporize the liquid after removing the body from the heating liquid and before applying the testing agent. If inflammable liquids are employed, suitable precautions against fire should be taken; because of the general availability of the medium and the absence of a fire hazard, hot water is usually preferred for heating the test body.

The test body is then allowed to cool while the portion of the surface to be tested is covered with the testing agent. This is usually accomplished by simply immersing the heated test body in a bath of the testing agent maintained at approximately room temperature. While the test body is being cooled in the bath of the testing agent, the testing agent quickly penetrates the surface openings of the flaws. By the time the test body has been cooled to approximately room temperature, the testing agent will usually have penetrated all detectable flaws, although the time the test body is allowed to remain in the bath of the testing agent may depend upon the penetrating ability of the testing agent and the degree of fineness of the flaws desired to be revealed. As pointed out above, a preferred testing agent is a water-emulsifiable luminescent liquid capable of penetrating the flaws to be revealed. Specific examples of suitable testing agents are given below.

After the test body has been immersed in the testing agent, the body is removed from the bath and excess testing agent is allowed to drain off. The testing agent remaining on the surface of the body is then washed off with wash water. To wash off the testing agent, the body may be simply sloshed in a vat or subjected to streams or sprays of wash water. If streams or sprays are employed, it is preferable that they should be no more forceful than necessary to wash the testing agent off the surface of the test body. The washed test body is then drained of wash water and may be dried by streams of warm air to evaporate wash water. Other procedures may be employed to remove excess wash water, such as by wiping the test bodies with absorbent cloths or by preferentially wetting the surface with another liquid according to the disclosure of the copending application of Taber de Forest for Wet developer, Serial No. 563,798, filed November 16, 1944.

After the testing agent has been washed from the surface of the test body, a portion of the testing agent which penetrated the surface openings of the subsurface flaws in the body is forced or drawn to or on the surface of the body. In many instances sufficiently accurate results are obtained by either heating the body or by applying on the surface of the body a fine light-reflecting agent, termed a "developer," which apparently absorbs the testing agent by capillary attraction. For best results both an absorptive agent and heat are employed. A satisfactory light-reflecting absorptive agent is French talc, applied in either a dry finely powdered state or as a thin suspension. Other satisfactory developers are disclosed in the above identified application of Taber de Forest and, if the developer is one which preferentially wets the test body, the steps of removing wash water and developing may be conducted simultaneously.

The body is then inspected under suitable lighting conditions which will permit the light emitted by the luminous agent in or adjacent the surface openings of the flaws to contrast with the surface of the body. Usually the test bodies are inspected visually in darkened rooms or booths under sources of ultraviolet light from which nearly all visible light has been filtered. Under such conditions, the substantial absence of incident visible light upon the test body and the high concentration of light emitted by the fluorescing testing agent affords such a high contrast ratio that the location and extent of very minute flaws is readily detectable. When French talc is employed as an absorptive agent, not only is the testing agent apparently drawn out of the flaws by the capillary attraction of the talc so that the talc is wetted and tends to cling to the surface of the body adjacent the flaw openings, but also the white talc reflects visible light emitted by the luminescent testing agent which light might otherwise be absorbed by the dark surface of the test body. Any other suitable lighting conditions which will afford a high contrast between the luminescent testing agent and the test body may obviously be employed. Also, light-sensitive means other than the human eye, such as a photographic camera or a photo-electric cell, may be employed to respond to the contrast between the testing agent and the test body.

A suitable testing agent for use with the foregoing method should exhibit several essential characteristics, namely, excellent penetrating and surface wetting properties, water-emulsifiability, and brilliant fluorescence. The unique characteristic of such testing agents as compared with the testing agents disclosed in the aforesaid Switzer patent is that of water-emulsifiability. It has been discovered that this characteristic allows the testing agent to be washed off the surface of the test body without being appreciably washed out of the flaw openings. These three characteristics are usually obtained by compounding the testing agent of a penetrant, a fluoragent, and an emulsifying agent which renders the testing agent water-emulsifiable. The penetrant is a water-insoluble oil or like liquid; it may be a single petroleum or hydrocarbon fraction or a number of them proportioned to give the penetrant good metal wetting characteristics, low surface tension, low volatility, suitable viscosity, and proper solvent power for the other constituents. The fluoragent is an ingredient foreign, i. e., added, to the other ingredients of the testing agent. The fluoragent should preferably impart such fluorescence to the testing agent and so enhance any natural fluorescence of the penetrant and/or the emulsifying agent that thin films of the testing agent will fluoresce with a distinctive brightness and color under ultraviolet, that is, the fluorescent light emitted by the fluoragent is preferably of such a dominant wave-band that the fluorescent light emitted by the testing agent is of a dominant wave-band different from the dominant wave-band of light which may be emitted by the penetrant, the emulsifying agent, and/or extraneous substances likely to be present on the surface of the test body. Several satisfactory fluoragents are commercially available and are generally known as oil-soluble fluorescent dyes. The emulsifying agent is usually composed of one or more oil-soluble soaps, detergents, or other surface-tension reducing agents which render the testing agent "self-emulsifying," that is, the testing agent will emulsify directly in water; in some instances it may be expedient to employ soaps or detergents which are not in themselves oil-soluble but which may be held in solution by a mutual solvent or coupling agent (often an alcohol) for the actual emulsifier and the oil; for the purposes of this invention, such mutual solvents or coupling agents may simply be considered a part of the emulsifying agent. It is not essential to incorporate the emulsifying agent in the testing agent. Instead, the emulsifying agent may be incorporated in the wash water; in such instances, the testing agent may, for the purposes of this invention, be considered "emulsifiable" but not "self-emulsifying."

In formulating a specific testing agent, numerous variables must be considered. In selecting a specific penetrant to be employed, one should select a penetrant which will thoroughly wet the surface of the specific type of article to be tested. For example, penetrants which are excellent for metal may be less satisfactory for plastics and ceramics. The type of discontinuity likely to be found is also a factor in selecting a proper penetrant. If the flaws are likely to be blowholes, shrinkage cracks, or similar flaws having relatively large volumes and open surface openings such as may be found in cast metal articles, one may often use a penetrant which does not have the extremely thorough wetting properties and low viscosity necessary in a penetrant used for locating discontinuities having relatively closed surface openings such as grinding cracks, forging bursts, and the like. In selecting an emulsifying agent, one should avoid those which tend to form scums or sludges with the penetrant selected. The concentration of emulsifying agent is dependent not only upon the efficacy of the specific agent but also upon the type of discontinuity likely to be found. If the flaws are likely to be shallow, the testing agent should be removable by a very gentle washing; if the flaws are likely to be deep and with relatively closed surface openings, the concentration of emulsifying agent may be decreased to permit complete emulsification to be obtained with the aid of sprays exerting a strong scrubbing action. Nearly all effective fluoragents exhibit substantially maximum fluorescent brightness at very low concentration in the testing agent; greater concentration may actually decrease fluorescent brightness. Fluoragents, therefore, are usually selected on the basis of inherent fluorescent brightness and stability in the testing agent.

From the foregoing it is apparent that in the testing agents the proportions of penetrant and emulsifying agent may vary widely whereas the proportion of fluoragent will usually be very low for all types of testing agents. In any given case the proportions will depend upon the requirements of the articles to be tested and the properties of the specific ingredients, but in general the concentration of penetrant may vary from approximately fifty to ninety-seven percent by weight, the concentration of emulsifying agent may vary from approximately three to fifty percent by weight, and the concentration of fluoragent may vary from approximately one-tenth of one percent to one percent by weight.

Illustrative but not limitative examples of suitable testing agents are as follows:

Example 1:	*Percent (by weight)*
1. Straight-run petroleum distillate, 300° F. fire point	83
2. Di (octadecyl carbonic) ester of leuco dimethoxy dibenzanthrone	.3
3. Napthenic acid soap (molecular weight about 350)	16.7

Example 2:	
1. Kerosene	77.6
2. Perylene	.4
3. Octylaminoethanol soap of tetradecyl sulfuric acid	22

Example 3:	
1. Kerosene	49
2. Dinaphthylene oxide	1
3. Sodium salt of mahogany acid	50

Example 4:	
1. Kerosene	54.64
2. Di (octadecyl carbonic) ester of leuco dimethoxy dibenzanthrone	0.36
3. Sodium dodecyl benzenesulphonate	18
Cyclohexanol	27

In this example, the cyclohexanol serves as a mutual solvent for the penetrant, kerosene, and the emulsifying agent, sodium dodecyl benzene-sulphonate. The cyclohexanol may, therefore, be considered part of the emulsifying agent.

Example 5:	*Percent (by weight)*
1. "Texaco" penetrating oil	67.9
Ethylene glycol monobutyl ether	16
2. Ethyl ester of meta monoethylaminophenol phthalein	.1
3. Naphthenic acid soap	16

In this example ethylene glycol monobutyl ether serves to maintain the fluoragent in solution in the penetrant and may, therefore, be considered either part of the penetrant or part of the fluoragent. In this connection, it should also be pointed out that many fluoragents as sold commercially are dissolved in diluent vehicles. The concentration of active fluoragent in any of the foregoing examples is stated on the basis of a pure fluoragent undiluted by impurities or commercial diluent vehicles.

Example 6:	*Percent (by weight)*
1. Kerosene	73.5
S. A. E. 50 motor oil	22
2. Di (octadecyl carbonic) ester of leuco dimethoxy dibenzanthrone	1.5
3. Refined sulphonated aromatic petroleum fractions [approximate empirical formula: $C_{26}H_{25}SO_3Na$; approximate molecular weight: 430]	3

When inspecting test bodies according to the above described methods, it is often desirable to inspect the test body while the testing agent is being drawn or forced out of the flaws in order to obtain a qualitative as well as a quantitative analysis of the flaws. Thus, for example, where the testing agent first appears as a thin bright line and then widens without diminishing in brightness, a narrow deep crack will be indicated; where the testing agent appears as a comparatively wide line and then diminishes in brightness as the line widens, a wide and shallow crack is indicated.

It is also to be understood that this invention, particularly with respect to the testing agent, is not to be limited to the embodiments disclosed, which were given by way of example, but that this invention may be modified and varied by those skilled in the art. The limitations of this invention, therefore, are not set forth in the foregoing specification but in the following claims.

What is claimed is:

1. The method of detecting in a test body subsurface flaws having surface openings comprising the steps of applying to the surface of the body a water-emulsifiable luminescent testing agent which will penetrate the surface openings of the subsurface flaws, washing the testing agent from the surface of

the body, and exuding from the surface openings of the flaws a portion of the testing agent which had penetrated into the flaws, whereby the location and extent of the flaws will be revealed by the visible light emitted by the luminescent testing agent on the surface of the test body.

2. The method as defined in claim 1 including the step of subjecting the test body to fluorescigenous radiations to cause the testing agent to fluoresce.

3. The method as defined in claim 1 including the steps of subjecting the test body to fluorescigenous radiations in the substantial absence of visible light and inspecting the surface of the test body with light-sensitive means, whereby the presence of flaws will be revealed by visible light emitted by the testing agent.

4. The method of detecting in a test body subsurface flaws having surface openings comprising the steps of heating the test body, applying to the surface of the test body a fluorescent testing agent which penetrates the surface openings of the subsurface flaws, cooling the test body, removing the testing agent from the surface of the body, exuding from the surface openings of the flaws a portion of the testing agent which had penetrated the surface openings of the flaws, and then inspecting the test body under fluorescigenous radiation.

5. The method as defined in claim 4 in which the step of exuding the testing agent comprises the step of applying a light-reflecting capillary absorptive agent to the surface of the test body.

6. The method as defined in claim 4 in which the step of exuding the testing agent comprises the step of reheating the test body.

7. The method as defined in claim 4 in which the step of exuding the testing agent comprises the steps of applying a light-reflective capillary absorptive

agent to the surface of the test body and reheating the test body.

8. The method of testing a body for surface discontinuities comprising the steps of heating the body in a hot liquid, drying the body, immersing the body in a bath of a cooler water-emulsifiable fluorescent testing agent which penetrates the surface discontinuities of the body, washing the testing agent from the surface of the body with water, applying a light-reflecting capillary absorptive agent to the surface of the body, reheating the body, and then inspecting the body under ultraviolet light in a substantial absence of incident visible light.

9. The method as defined in claim 8 in which the step of reheating the body is conducted simultaneously with the step of inspecting the body.

10. In a method of detecting in a test body subsurface flaws having surface openings, the steps of immersing the test body in a bath of a luminescent testing agent which is relatively cooler than the test body and which penetrates the surface openings of the subsurface flaws, removing the test body from said bath, removing the testing agent from the surface of the body, and then examining the test body with light-sensitive means for visible light emitted by the portion of the testing agent which had penetrated into the subsurface flaws and appears at the surface openings of said flaws.

11. In a method of detecting in a test body subsurface flaws having surface openings, the steps of applying to the surface of a test body a water-emulsifiable luminescent testing agent which will penetrate the surface openings of the subsurface flaws, washing the testing agent from the surface of the body, subjecting the test body to fluorescigenous radiation in the substantial absence of visible light, and inspecting

the surface of the test body with light-sensitive means, whereby the presence of flaws will be revealed by visible light emitted by the testing agent retained in the surface openings of the subsurface flaws during the step of washing the testing agent from the surface of the test body.

12. The method of detecting in a test body subsurface flaws having surface openings comprising the steps of heating the test body, applying to the surface of the test body a relatively cooler fluorescent testing agent which penetrates the surface openings of the subsurface flaws, cooling the test body, removing the testing agent from the surface of the test body, and then inspecting the test body under fluorescigenous radiation, whereby the presence of flaws will be revealed by visible light emitted by the testing agent retained in the surface openings of the subsurface flaws during the step of removing the testing agent from the surface of the body.

13. In a method of detecting in a test body subsurface flaws having surface openings, the steps of applying to the surface of a test body a luminescent testing agent which is relatively cooler than the test body and which penetrates the surface openings of the subsurface flaws, removing the testing agent from the surface of the body, and then examining the test body with light-sensitive means for visible light emitted by the portion of the testing agent which had penetrated into the subsurface flaws and appears at the surface openings of said flaws.

14. The method of testing a body for surface discontinuities comprising the steps of heating the body in a hot liquid, drying the body, immersing the body in a bath of a cooler water-insoluble emulsifiable fluorescent testing agent which penetrates the surface discontinuities of the body, washing the testing agent

from the surface of the body with water in the presence of an emulsifying agent for the testing agent, applying a light-reflecting capillary absorptive agent to the surface of the body, reheating the body, and then inspecting the body under ultra-violet light in a substantial absence of incident visible light.

15. The method as defined in claim 1 in which the step of exuding the testing agent comprises the step of applying a light-reflecting capillary absorptive agent to the surface of the test body.

16. A testing agent for testing bodies for surface discontinuities comprising a water-insoluble self-emulsifying flaw-penetrating oily liquid and a fluoragent soluble in said liquid.

17. A testing agent for testing bodies for surface discontinuities comprising a water-insoluble oily liquid, a fluoragent soluble in said liquid, and an emulsifying agent soluble in said liquid to render the testing agent self-emulsifying in water.

18. A testing agent for testing bodies for subsurface flaws having surface openings comprising a penetrant comprised of a light petroleum distillate, a fluoragent dissolved in said penetrant, and an emulsifying agent dissolved in said penetrant to render the testing agent self-emulsifying in water.

19. A testing agent for testing metal bodies for subsurface flaws having surface openings comprising a penetrant comprised of a plurality of metal-wetting water-insoluble oils, a fluoragent dissolved in said penetrant, and an oil-soluble soap dissolved in said penetrant in sufficient concentration to render said penetrant self-emulsifying.

20. A testing agent for testing bodies for surface discontinuities comprising a penetrant comprised of a water-insoluble oily liquid, an emulsifying agent dispersible in said penetrant to render the testing agent

self-emulsifying in water, and a fluoragent soluble in said penetrant and foreign to other ingredients of the testing agent.

21. A testing agent as defined in claim 20 in which said fluoragent comprises an oil-soluble fluorescent dye emitting, when in solution and subjected to invisible fluorescigenous radiations, a dominant wave-band of visible light different from the dominant wave-band of any fluorescent light emitted by said penetrant and said emulsifying agent, the concentration of said fluoragent in the testing agent being in excess of one-tenth of one percent to impart a brightness and fluorescent color to said testing agent which is distinctive from any natural fluorescence of said penetrant and said emulsifying agent.

22. A testing agent as defined in claim 20 in which said fluoragent comprises a fluorescent dye and a mutual solvent for said dye and said penetrant, said dye emitting, when in solution and subjected to fluorescigenous radiations, visible light distinctive from any natural fluorescence of said penetrant and said emulsifying agent, the concentration of said dye in the testing agent being in excess of substantially one-tenth of one percent to impart a distinctive brightness and color to the testing agent.

23. A testing agent as defined in claim 20 in which the concentration of said penetrant in the testing agent ranges between substantially fifty percent and ninety-seven percent by weight of the testing agent.

24. A testing agent as defined in claim 20 in which the concentration of said emulsifying agent in said testing agent ranges between substantially three percent and fifty percent by weight of the testing agent.

25. In a method of detecting in a test body subsurface flaws having surface openings, the steps of applying to a surface of the test body a water-emulsifiable

luminescent testing agent which will penetrate into the surface openings of the subsurface flaws and which contains a fluoragent foreign to the other ingredients of the testing agent, washing the testing agent from the surface of the test body with an aqueous washing medium, removing the washing medium from the surface of the test body, subjecting the test body to fluorescigenous radiations and then inspecting the surface of the test body, whereby the presence of subsurface flaws having surface openings will be revealed by visible light emitted by the testing agent retained in the surface openings of the flaws during the step of washing the testing agent from the surface of the test body.

26. In a method of detecting in a test body subsurface flaws having surface openings, the steps of applying to a surface of the test body a luminescent liquid testing agent which will penetrate into the surface openings of the subsurface flaws and which contains a fluoragent, washing the testing agent from the surface of the test body with an aqueous washing medium capable of emulsifying said liquid testing agent, removing the washing medium from the surface of the test body, subjecting the test body to fluorescigneous radiations and then inspecting the surface of the test body, whereby the presence of subsurface flaws having surface openings will be revealed by visible light emitted by the testing agent retained in the surface openings of the flaws during the step of washing the testing agent from the surface of the test body.

27. The method of detecting surface flaws in a body comprising the steps of immersing the body in a solution emulsifiable in water and containing a fluorescent substance, washing the excess solution from the surface of the body with water, drying the surface of the body, and then subjecting the body to fluorescigenous radiations.

28. The method of detecting flaws in a body comprising the steps of heating the body, applying to the surface of the body a relatively cool fluorescent solution which will penetrate into the surface flaws of the body, cleaning the surface of the body to remove the excess solution, and then subjecting the body to fluorescigenous radiations.

RICHARD A. WARD.

TRANSLATION OF SWISS PATENT NO. 224242, CLASS 62, TO I. G. FARBENINDUSTRIE AKTIENGESELLSCHAFT, FRANKFURT A. M. (GERMANY); APPLICATION FILED SEPTEMBER 30, 1941; PATENT RECORDED NOVEMBER 15, 1942; PUBLISHED FEBRUARY 1, 1943 (PRIORITY: GERMANY, NOVEMBER 6, 1940)

TESTING PROCESS FOR DETERMINING SHRINKAGE HOLES AND SIMILAR DEFECTS IN CASTINGS OF LIGHT METAL ALLOYS, ESPECIALLY MAGNESIUM ALLOYS

The so-called oil boiling test is used as a nondestructive testing method for determining shrinkage holes in castings of magnesium alloys. This test consists in dipping the casting for a short time in hot machine oil of about 150° C. and afterwards subjecting it to sand blast. Fine shrinkage holes, cracks, and similar casting defects then very often become apparent through spots of oil on the surface of the casting. But the masses of oil exuding quickly separate, so that a positive detection of the expansion of the shrinkage holes is difficult and uncertain.

The idea basing the present invention is to make apparent the shrinkage holes in castings of light metal alloys, especially magnesium alloys, by causing blisters of colored substances as an index of the defective places; these blisters are caused by treating the castings for at least 15 minutes in solutions of colored substances and then rinsing off and drying the surface of the casting. Good results can be obtained with the use of aqueous and alcoholic solutions of organic dyestuffs, as, e. g., nigrosine and zapon true black M, if the castings are immersed for at least 15 minutes, preferably 30, in the heated solution, then rinsed off well, and finally dried at elevated temperature, whereafter the dye solution exudes from the places affected with shrinkage holes so as to be clearly visible.

Thorough investigations have led further to the discovery, that a very good and satisfactory visualization of the places affected with shrinkage holes in light metal alloy castings, especially those of magnesium alloys, can be effected, if the castings are treated with chromate-containing solutions, then rinsed off with cold water, and dried, e. g., by brief immersion in hot water or by blasting with hot air. Then a few minutes after drying yellow chromate exudes from the pores, which can be clearly distinguished from the white, yellowish white, or gray surface of the casting. The yellow blisters generally become larger for a few hours, but after 12 hours come to complete rest. The chromate which has exuded entails no risk of corrosion. It sits loosely on the surface and can be easily removed by brushing.

The concentration of chromate in the solution may vary widely. It suitably amounts to at least 3% and may be increased up to the saturation point. For reasons of economy a concentration of about 8% is preferably used.

The temperature of the chromate-containing baths, in order to maintain a bearable length of treatment, amounts to at least 40° C. and may be increased to the boiling point of the solutions; suitable bath temperatures to use are between 70° and 80° C.

The length of treatment of the castings in the chromate-containing baths, especially with reference to the differing temperatures of the baths, may also vary, but should amount to at least 15 minutes.

The formation of the blisters, i. e., the exuding of the chromate remaining in the pores after treatment, can be accelerated by certain additions to the chromate-containing solutions. Liquid organic compounds, such as, e. g., butyl and amyl alcohol, whose boiling points lie somewhat above that of water, have, on the one hand, proved to be suitable additions and, on the other hand, substances, such as ammonium acetate, e. g., whose decomposition products formed as a consequence of reaction with the casting likewise exude from the pores during drying. The concentration of these additions also may vary within wide limits, but with an increasing content of these additions the quantity of chromate exuding from the pores increases, so that the precision of indication can be adjusted at will.

For better visualization and detection of the yellow chromate blisters they may be converted into chromium compounds of darker color. For this purpose a treatment with sulphurous acid has been proved appropriate.

It has also been proved expedient to subject the castings in the present process, as in the oil boiling test, to a brief pickling treatment with dilute nitric acid, after the usual cleaning of the surface by sand blast, in order to open the pores. Example.

A casting of magnesium alloy with 3% zinc and 6% aluminum after sand blasting, to further open the pores, was pickled for about 15–20 seconds in 5% nitric acid and thoroughly rinsed off with cold water. The casting was then held in a solution heated to about 70°–80° and containing 8 kg. of potassium bichromate and 1.5 kg. of ammonium acetate in 100 liters of water in an aluminum tank for about 30 minutes. The casting was then rinsed off quickly with cold water and dried by brief immersion in hot water. Blisters of a yellow salt appeared within approximately only five minutes after drying at the porous places, which in the course of a few hours became larger.

The above-described process can be employed with equal success in the case of castings of alloys having a basis of either magnesium or aluminum for the determination of shrinkage holes and similar defects.

PATENT CLAIM

Testing process for the determination of shrinkage holes and similar defects in castings of light metal alloys, especially magnesium alloys, characterized thereby, that blisters of colored substances are produced as an index of defective places by treating the castings for at least 15 minutes in solutions of colored substances and then rinsing off and drying the surface of the casting.

SUBCLAIMS

1. Process according to patent claim, characterized thereby, that the castings are treated with chromate-containing solutions.

2. Process according to patent claim and subclaim 1, characterized thereby, that the castings are treated at temperatures between 40° C. and the boiling point of the solutions with chromate-containing solutions.

3. Process according to patent claim and subclaims 1 and 2, characterized thereby, that the castings are first subjected to sand blast.

4. Process according to patent claim and subclaims 1 to 3, characterized thereby, that the castings after treating with sand blast are subjected to a brief treatment with dilute sulphuric acid.

5. Process according to patent claim and subclaims 1 to 4, characterized thereby, that organic liquid compounds are added to the chromate-containing solutions, whose boiling points lie somewhat above that of water.

6. Process according to patent claim and subclaims 1 to 5, characterized thereby, that butyl alcohol is added to the chromate-containing solutions.

7. Process according to patent claim and subclaims 1 to 5, characterized thereby, that amyl alcohol is added to the chromate-containing solutions.

8. Process according to patent claim and subclaims 1 to 4, characterized thereby, that substances are added to the chromate-containing solutions whose decomposition products, formed as a consequence of reaction with the casting, exude from the pores during drying.

9. Process according to patent claim and subclaims 1 to 4 and 8, characterized thereby, that ammonium acetate is added to the chromate-containing solutions.

10. Process according to patent claim and subclaims 1 to 4, characterized thereby that yellow chromate blisters are transformed into chromium compounds of darker color.

11. Process according to patent claim and subclaims 1 to 4 and 10, characterized thereby, that the transformation of the yellow chromate blisters takes place by treatment with SO_2 gas.

12. Process according to patent claim and subclaims 1 to 4, 8 and 9, characterized thereby, that the castings are treated for about 30 minutes in an eqeuous solu-

tion containing about 8% potassium chromate and 1.5% ammonium acetate at 70° to 80° C.

In the United States Court of Customs and Patent Appeals

Patent Appeal No. 6208

IN THE MATTER OF THE APPLICATION OF RICHARD A. WARD AND ROBERT C. SWITZER

DETECTION OF FLAWS

Serial No. 606,708

Filed July 23, 1945

Petition of appeal

To the Honorable Judges of the United States Court of Customs and Patent Appeals:

Now come your Petitioners, Richard A Ward and Robert C. Switzer, respectively of Cleveland and Shaker Heights, Ohio, and, by their attorney, respectfully represent:

That the said Richard A. Ward and Robert C. Switzer were the original and first inventors of certain new and useful improvements in Detection of Flaws.

That on July 23, 1945, in the manner prescribed by law, they presented their application to the Patent Office, praying that a patent be issued to them for said invention.

That proceedings were had in the said Office upon said application;

That on March 31, 1953, claims 1, 2, 4, 5, 7, 8, and 9 were rejected by the Board of Appeals, but the Board of Appeals reversed the Examiner's rejection of claims 13, 14, 15, 16, and 17 on the grounds of misjoinder; that, in response to a duly filed petition for reconsideration of the rejection of claims 1, 2, 4, 5, 7, 8, and 9, the Board of Appeals, on April 23, 1953, in order to avoid piecemeal review of the claims in said application, suspended consideration of said petition for reconsideration until appropriate action had been taken with respect to claims 13, 14, 15, 16 and 17; that on September 24, 1954 the Board of Appeals, considering all claims, rejected claims 1, 2, 4, 5, 7, 8, 9, 13, 14, 15, 16, and 17; that on October 25, 1954 petition for reconsideration as to claims 1, 2, 4, 5, 7, 8, 9, 13, 14, 15, 16, and 17 was filed; that upon consideration of the petition for reconsideration the Board of Appeals on November 10, 1954, adhered to its rejection of claims 1, 2, 4, 5, 7, 8, 9, 13, 14, 15, 16, and 17.

That on November 23, 1954, your petitioners, pursuant to Title 35, United States Code, Sections 142 and 143, gave notice to the Commissioner of Patents of their appeal to this Honorable Court from the refusal to issue a patent to them for said invention upon said application, as aforesaid, and particularly as to claims 1, 2, 4, 5, 7, 8, 9, 13, 14, 15, 16, and 17 and filed with him in writing the reasons for appeal.

That the Commissioner of Patents has furnished him a certified transcript of the record and proceedings relating to such application as are necessary to a correct understanding of the issues and reasons for rejection and this appeal including the notice and reasons of appeal, which transcript is filed herewith and is to be deemed and taken as a part hereof.

Wherefore your petitioners pray that their said appeal may be heard upon the reasons assigned therefor to the Commissioner as aforesaid, and that said appeal may be determined and the decision of the Commissioner be revised and reversed, that justice may be done in the premises.

RICHARD A. WARD AND
ROBERT C. SWITZER,
By ALBERT L. ELY, JR.,
Their Attorney.

[Indorsed:] United States Court of Customs and Patent Appeals. Filed Jan. 11, 1955. Cabell N. Pryor, Clerk.

REJECTED CLAIMS

1. The method, of detecting in a test body subsurface flaws having surface openings, comprising the steps of applying to the surface of the body a water-emulsifiable testing agent having a color contrasting with the surface of the test body and which will penetrate the surface openings of the subsurface flaws, washing the testing agent from the surface of the body, and exuding from the surface openings of the flaws a portion of the testing agent which had penetrated into the flaws, whereby the location and extent of the flaws will be revealed in visible light by the difference in color of the exuded testing agent and that of the test body.

2. The method as defined in Claim 1 including the step of subjecting the test body to filtered visible light to improve the visibility of the testing agent at the surface of the test body.

4. The method as defined in Claim 3 in which the step of exuding the testing agent comprises the step of reheating the test body.

5. The method as defined in Claim 3 in which the step of exuding the testing agent comprises the steps of applying a light-reflective capillary absorptive

agent to the surface of the test body and reheating the test body.

7. In a method of detecting in a test body subsurface flaws having surface openings, the steps of applying to the surface of a test body a water-emulsifiable colored testing agent which will penetrate the surface openings of the subsurface flaws, washing the testing agent from the surface of the body, and inspecting the surface of the test body with light-sensitive means under visible light, whereby the presence of flaws will be revealed by the testing agent retained in the surface openings of the subsurface flaws during the step of washing the testing agent from the surface of the test body.

8. In a method of detecting in a test body subsurface flaws having surface openings, the steps of applying to a surface of the test body a self-emulsifying, oily, colored testing agent which will penetrate into the surface openings of the subsurface flaws and which contains a color material foreign to the other ingredients of the testing agent, washing the testing agent from the surface of the test body with an aqueous washing medium, removing the washing medium from the surface of the test body, and then inspecting the surface of the test body in visible light, whereby the presence of subsurface flaws having surface openings will be revealed in visible light by the color of the testing agent retained in the surface openings of the flaws during the step of washing the testing agent from the surface of the test body.

9. In a method of detecting in a test body subsurface flaws having surface openings, the steps of applying to a surface of the test body a colored liquid testing agent which will penetrate into the surface openings of the subsurface flaws and which contains a color ma-

terial imparting to the testing agent a color different from that of the surface of the body when inspected, washing the testing agent from the surface of the test body with an aqueous washing medium capable of emulsifying said liquid testing agent, removing the washing medium from the surface of the test body, and then inspecting the surface of the test body, whereby the presence of subsurface flaws having surface openings will be revealed by the different color of the testing agent retained in the surface openings of the flaws during the step of washing the testing agent from the surface of the test body.

13. A testing agent for testing bodies for surface discontinuities comprising a substantially anhydrous water-insoluble self-emulsifying flaw-penetrating oily liquid and a color material dispersed in said liquid.

14. A testing agent for testing bodies for surface discontinuities comprising a substantially anhydrous water-insoluble oily liquid, a color material suspended in said liquid, and an emulsifying agent soluble in said liquid to render the testing agent self-emulsifying in water.

15. A testing agent, for testing bodies for subsurface flaws having surface openings, comprising a penetrant comprised of a light petroleum distillate, an oil-soluble colored dye dissolved in said penetrant, and an emulsifying agent dissolved in said penetrant to render the testing agent self-emulsifying in water.

16. A testing agent, for testing metal bodies for subsurface flaws having surface openings, comprising a penetrant comprised of a plurality of metal-wetting water-insoluble oils, an oil-soluble colored dye dissolved in said penetrant in sufficient concentration to impart discernible color to said agent when said agent spreads itself in a film on a metal surface, and an oil-soluble soap dissolved in said penetrant in sufficient

concentration to render said penetrant self-emulsifying.

17. A testing agent for testing bodies for surface discontinuities comprising a penetrant comprised of a water-insoluble oily liquid, an emulsifying agent dispersible in said penetrant to render the testing agent self-emulsifying in water, and a colored dye soluble in said penetrant and foreign to other ingredients of the testing agent.

[Indorsed:] United States Court of Customs & Patent Appeals. Filed Jan. 11, 1955. Cabell N. Pryor, Clerk.

U. S. GOVERNMENT PRINTING OFFICE: 1957

REPLY BRIEF FOR APPELLANT.

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT.

Appeal No. 13,948.

ROBERT C. SWITZER,
Appellant,
vs.
ROBERT C. WATSON,
Commissioner of Patents,
Appellee.

APPEAL FROM JUDGMENT OF
THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA.

ALBERT L. ELY, JR.,
ELY, PEARNE & GORDON,
912 Midland Building,
Cleveland 15, Ohio,
Attorneys for Appellant.

THE GATES LEGAL PUBLISHING CO., CLEVELAND, OHIO—MAIN 1-3647

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REPLY BRIEF FOR APPELLANT.

Appellee's brief charges appellant's counsel with discourtesy to appellee and the Court in "flouting" Rule 17(c). Most certainly no discourtesy to either was intended, and it is not understood that Rule 17(c) was breached. If it were, appellant begs the pardon of both the Court and appellee. Appellant's counsel understands that the rule requires notice to appellee of the part of the record to be printed in appellant's appendix in order that a joint appendix may be printed; when the entire record is printed, it is not understood that such notice is required or expected. On the other hand, the appendix to appellee's brief contains only excerpted portions of exhibits below, including portions of the record in another case, all certified as physical exhibits from the trial Court. Since, win or lose, appellee is guaranteed all of his printing expenses by the Statute, 135 U. S. 145, appellee's counsel apparently did not feel the usual burden to economize that falls on private litigants and elected to reprint issued and printed patents (Switzer patent No. 2,259,400; Ward patent No. 2,405,078, App. 36b-71b, though the appendix size is adapted to receive printed patents), and even such matters (though no reference is made to them in appellee's brief) as the formal oath of the application in suit (App. 17b-19b) and the Examiner's brief in the Patent Office Board of Appeal hearings—i.e., appellee's own arguments (App. 19b-22b). If any censure is called for, it is respectfully submitted that undue enlargement of printing costs, which must be borne in any event, by an adversary, should not escape.

REBUTTAL ARGUMENT.

Prior Art.

At the outset of appellee's brief following the *ad hominem* charges against appellant's counsel, the disclosures of the prior issued patent are purported to be stated, but they are stated in such a fashion as to conceal what the prior art actually disclosed and wherein the present invention made a substantial and surprising advance, which, as is self-evident from the omission of appellee, was not apparent to those skilled in the art at the time this invention on appeal was made. Thus, the Ward patent, 2,405,078, and appellee's own prior patent, 2,259,400, as well as the invention in suit, all relate to methods of disclosing the location of surface flaws in aircraft parts and the like which may be nearly submicroscopic and not visible to the unaided eye. In both the Switzer and Ward patented processes and in the process here, these flaws are revealed by a penetrant solution applied to the parts to be tested. The composition of the penetrating agents, how they operate to reveal the flaws, and the steps followed to cause the agents to operate is, of course, the difference between the invention on appeal and the disclosures of the issued patents.

In describing the appellant's prior patent, No. 2,259,400, appellee states (Br. p. 5) that this prior patent discloses the use of "dyestuffs" in the penetrating agent, and it must be conceded appellant uses dyestuffs in the penetrating agents of the present invention. But nowhere in appellee's brief is it revealed that the dyestuffs disclosed in the Switzer patents are *only* fluorescent dyestuffs which are either colorless or only so weakly colored in themselves that they do not color the surface to be tested

(App. 25a-27a). Later in appellee's brief, the concealment that the dyes of the Switzer patented process were only fluorescent dyes having an effect only under "black light" is further distorted to a misstatement that the Switzer patent "discloses a testing method in which the article is treated with a colored agent (dyes) in oily or non-oily solution" (Br. p. 23). The misconception that the fluorescent dyes of the Switzer or Ward patent could be a coloring material—in the sense of imparting a visible color to a surface in ordinary light—is a misconception that not only flies in the face of the very physical exhibits in the suit, but is a misconception in which appellee's trial counsel attempted to trap the witness Joseph Switzer and failed (App. 25a-27a).

With respect to the steps of the patented Switzer and Ward processes, appellee states:

> "The treating agent and inspection conditions are correlated to give maximum contrast between the surface of the article being tested and the agent retained in and about the flaws." (Appellee's Br., p. 5.)

and

> "Inspection [under the Ward process] is under suitable lighting conditions as described in the Switzer patent." (Appellee's Br. p. 6.)

"Suitable lighting conditions" and "Inspection conditions correlated, etc." indeed! Both the patented Switzer and Ward process requires inspection in darkness from which substantially all visible light is excluded and dyes are excited to fluorescence by invisible ultraviolet radiations requiring special electrical equipment (App. 18a-19a).

The problem presented by the patented Switzer and Ward processes (assuming for the purposes of this portion of argument that the co-pending Ward patent is prior art) was that even when such "suitable lighting conditions" are available, they present extremely difficult working conditions (Pl. Ex. 1, Specification pages 2 and 3; App. 2b). But the real problem was how could such flaws be located under field conditions where such expensive and special black light equipment and darkened inspection booths would be neither practical nor available—as for example, in oil fields, railroad yards, or a military field maintenance base, where the special lighting equipment presents a logistics problem and necessary voltage may not be available (App. 35a)?

The Germans tried to use ordinary color indications (Swiss E. G. Farbindustrie patent No. 224,242, 1943) but failed with an inoperative process. Whether or not the trial Court properly took judicial notice that appellant could have known of the publication of the Swiss patent in 1943 [knowledge that ordinary personal mail was sent from Switzerland does not establish that technical information and publications were transmitted through enemy lines], appellee's very argument that the Switzer and Ward patents disclose "color agents" shows that there is more to the present invention than merely substituting a "color agent" in the Switzer and Ward penetrants. The Switzer and Ward penetrants show no indication of flaws except under the special "black light" lighting conditions whereas appellant's process shows flaws in ordinary lighting such as in a Court room (App. 18a). The Court below not only erred in failing to apply the conditions of patentability as required by 35 U. S. C. 102 and 103, but appellee shows no answers to this question begged by the decision below: In the face of failure of both the Swiss process and the Switzer and Ward process to operate in ordinary light, why would a routineer in the art abandon the successful

Switzer and Ward process involving the phenomenon of fluorescence and look for success with a process employing ordinary color phenomenon in the face of the inoperative Swiss patent and the inability of the Switzer and Ward process to produce color indications? What in the prior art at the time appellant made his invention points out that the difference between success and failure lay in the distinctions set forth in the claims on appeal—i.e., that a *coloring material* would work if (a) it was used in an oily vehicle (avoiding the aqueous vehicles of the Swiss patent) and (b) it was used in conjunction with an absortive second liquid (not disclosed or suggested in the Swiss patent)? It is to be noted also that it is no mere play on words that there is a substantial difference between a mere "color agent" as appellee chooses to designate both the fluorescent dyes of Switzer and Ward and the non-fluorescent dyes employed by appellant and called for in Claim 3 as a "coloring material" which colors the surface of the part being tested (claim 11). The Switzer and Ward "color agents" if appellee is to pick this term out of the context of the application on appeal and apply it gratuitously to the Switzer and Ward fluorescent dyes, do not so color the surface being tested and thus are not "coloring material."

Res adjudicata.

Appellee's argument in support of *res adjudicata* by the Court of Customs and Patent Appeals in the *Application of Ward,* 236 F. 2d, 428, with respect to the claims on appeal here are both unsound and depend upon a confusion between the disclosures of applications and the subject matter claimed. Admittedly, the claims here were first presented in a parent application, Serial No. 606,708, filed jointly with Ward, and the specification of this application in suit, as a continuation-in-part application, is a practical duplicate of the specification of the joint application. But the claims of the parent joint application were directed to different subject matter, namely, use of a special penetrant removable by washing in water (the "single" concept held by the Court of Customs and Patent Appeals to have been originated by Ward alone and covered in his patent No. 2,405,078), whereas the claims here are directed to the development of flaw indications regardless of how the penetrant is removed from the surface of the test body. The Patent Office itself has recognized that the two applications, i.e., the parent joint application and the present sole application, relate to different subject matter by awarding appellant claims (1 and 2) in this present sole application, whereas none were ever allowed for the subject matter claimed in the parent joint application. It has long been recognized that an original joint specification may disclose two different inventions, one being a joint and the other a sole invention, and that the sole inventor is a different entity from the joint inventors who must claim his sole invention in a separate sole patent. *In re Roberts,* 263 F. 2d 646, 647; 49 Apps. DC 250 (1920).

Thus, this present suit and the case in the Court of Customs and Patent Appeals involve not only different subject matter, but different parties, appellant, as the sole inventor of the subject matter before this Court being a different entity from the joint applicants for the claims before the Court of Customs and Patent Appeals. It is axiomatic that neither the doctrine of *res adjudicata* nor *stare decisis* can apply unless both the parties and subject matter are the same. *Gaines v. New Orleans,* 73 U. S. 642, 698 (1867).

Double Patenting.

Appellee's attempt to justify the finding of the Court below that the claims here constitute double patenting of the issued Ward patent, which relates only to a fluorescent process depends upon doubly erroneous contentions.

First, appellee has to fly in the face of clear language of both the claims before the Court and the claims of the Ward patent. The claims of the Ward patent are all restricted to the use of luminous penetrants and the step of inspecting them under conditions where their luminosity is evident, i.e., under "black" light. The claims of the present invention call for coloring penetrants and inspection under conditions where their coloring is evident on the surface being tested, i.e., under visible light. To avoid the obvious mutual exclusivity of the Ward claims and the present claims—i.e., practicing the Ward invention would never infringe the claims on appeal and practicing the appellant's invention would never infringe the Ward claims—appellee must contend that colorless and non-coloring materials of Switzer and Ward are coloring materials (Br. p. 23). This is no different than saying black is white. It is arguing that colorless is colored. Appellee's refusal to recognize that fluorescent and non-fluorescent systems are mutually exclusive flies in the face of the recognition in industry and the Government's own military specifications that the systems are different (App. 24a). Not only are different materials, inspection techniques and conditions employed, but the two systems operate by different and unrelated phenomena (App. 21a).

Second, appellee must attempt to sustain the Court's finding that appellant did not adequately corroborate his antedating of the co-pending Ward patent by oral testimony [the veracity of which the Court said it did not question (App. 41a)] because the appellant's corroborating exhibits were "vague and indefinite."

Bearing in mind that appellant made this invention in the basement of his own home apart from his job in the Division of Luminescence of Continental Lithograph Corporation (App. 31a), that appellant kept any record of his work is surprising enough. What further detail than his longhand notes of appellant's results appellee would have expected appellant to keep under such circumstances, appellee does not explain.

Why or on what authority any corroboration is needed for the testimony of a witness whose veracity is accepted and recognized by the Trial Court, appellee cannot say. Nor does appellee explain wherein the corroborating documents are vague and indefinite. Nor can appellee say upon what authority appellee can require more cumulative evidence to overcome a patent as a reference in a suit to obtain a patent than is required to invalidate a patent in an infringement action. Reliance on the Ward patent is clearly indefensible.

For the foregoing reasons, it is submitted that, by having to resort to such fallacious arguments to support the decision of the Court below, appellee in effect confesses that the decision below is untenable and should be reversed.

Respectfully submitted,

ALBERT L. ELY, JR.,
Attorney for Appellant.